CONSERVATION

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FRANK GLOVER HEATON, *Editor*

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THE EFFECTS OF EROSION

The creek formerly flowed close to the base of the hills on the right. Its course now is over 100 yards wider, in many small channels. Erosion of the alluvial lands continue with every freshet, and several houses have been washed away in spring floods. Cane Creek, Mitchell Co., N C.

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THE NATIONAL CONSERVATION COMMISSION

What It Is Doing

By HENRY GANNETT, Geographer, U. S. Geological Survey

(EDITOR'S NOTE.—Mr. Gannett's official designation is Geographer of the U. S. Geological Survey. For several years past he has been assigned to the Census Bureau, and is now practically in charge of the Cuban census. At President Roosevelt's request, he was assigned to the statistical work connected with the work of the National Conservation Commission, because of his superior qualifications and ability. At the completion of the Cuban census Mr. Gannett will devote his entire time to the work for the National Conservation Commission.)

THE National Conservation Commission was formed for the purpose of conserving our natural resources; to reduce waste; to encourage proper and economical use; to increase the supply of such things as can be increased; to induce substitutions of one substance for another when desirable—in short, to encourage all possible measures for making our natural resources go as far as possible.

Naturally, the first step in such a work is to learn just where we stand—to take an inventory of our natural resources—to find out how much timber, iron, coal, land, water, water-power, etc., we have to draw on, and the rate at which our supplies are being used, and will probably be required in the future. To all this is naturally added the study of the amount and sources of waste and destruction.

With these matters are naturally associated the study of means of economizing, which is, of course, the ultimate end and aim.

The information sought by the Commission is being supplied by various government bureaus, nearly all those engaged in scientific or semiscientific work being more or less fully enlisted in its service.

The inquiries of the Commission naturally resolve themselves into four classes, following the work of the four committees composing the Commission. They relate to *Land, Water, Forest,* and *Mineral.*

Under *Land,* it asks for the policy and results of the public land system, and what changes in the land laws are desirable. This important matter has been taken up by the law office of the Interior Department. It asks whether there is a tendency toward monopolization of lands, whether farm, timber, or mineral lands, and the causes for such tendency, if it exists. The answer is being sought from several sources: the Bureau of Corporations, the Geological Survey, the Census, and by circular from the farmers.

A question of the greatest importance is whether our soils, as a whole, are being exhausted. This question is answered by a comparison of the yield per acre of certain major crops, at different times. To answer this question we have the statistics of the Census, and those of the Bureau of Statistics of the Department of Agriculture. If it has diminished in fertility, why has this occurred? How can soil erosion be reduced. To what extent is increased production per acre likely to be needed, and how can it be brought about? These questions have been submitted for opinions to the Bureaus of Soils, Plant Industry, and the Office of Experiment Stations of the Department of Agriculture.

Regarding the public range, the Commission asks its condition, the causes of this condition, and the methods by which it can be improved. The grazing division of the Forest Service is at work on this subject.

Concerning swamp and overflow lands, their extent and ownership are sought—also how much has been reclaimed, at what cost and with what financial result. Questions are also asked concerning the possible amount which can be reclaimed, with estimated cost and probable results or profits. This whole subject has been proposed to the Office of Experiment Stations and to the Hydrographic Branch of the Geological Survey.

Under the general subject of Water, and specifically Irrigation, the Reclamation Service is at work upon the following matters: The amount of land under irrigation. An estimate of the additional land that may be irrigated. Do present laws promote irrigation fully and wisely, and what modifications of law are desirable? The relations of irrigation to forests, navigation, water-power, water supply, drainage, and floods.

The underground water supply is being studied by the Hydrographic Branch of the Geological Survey.

The Weather Bureau has furnished full data concerning rainfall, and that office, in cooperation with the Hydrographic Branch of the Geological Survey, will furnish data concerning the flow of streams, with areas of stream basins. The same offices, in cooperation, are preparing information concerning floods, the specific questions asked being: Are floods increasing, and if so, why? To what extent are flood waters wasted? How much damage do they occasion? To what extent could flood waters be stored, at what cost, and at what saving?

The entire subject of water in its relation to transportation has been undertaken by the Bureau of Corporations, which has already made extended studies on this subject. Concerning this matter the Commission seeks the following information: Whether river navigation has diminished. If it has, the reasons for it. The advantages of an adequate system of inland waterways. How they can be fully untilized for traffic. In addition to the above, many minor subordinate matters are asked for.

The subject, Water-power, has been nearly all turned over for investigation to the Hydrographic Branch of the Geological Survey, with some cooperation from the Bureau of Corporations. The information desired is as follows: The developed and undeveloped water-

powers. Whether developed powers are put to their full use. How far can coal be saved by substitution of water-power. The Bureau of Corporations cooperates with the Hydographic Branch in obtaining information on the following subjects: Are water-powers being consolidated, and to what extent are water-powers owned by corporations subject to governmental control?

Nearly the entire matter of forests has been placed in the hands of the Forest Service. The Bureau of Corporations is cooperating in obtaining the amount of standing timber and the Census is obtaining the cut of lumber and the amount used as firewood. The matters confided to the Forest Service are as follows: The extent of our original forests. The amount of standing timber remaining. The annual cut. Past and present prices of products. Present rate of growth. How the productiveness of our forests can be increased. How long the present supply will last. What foreign sources of supply are in sight. How our forest resources, consumption and prices and uses of forest products compare with those of other countries. How the cost of our forest administration compares with that of other countries. How far foreign methods of forest administration are suited to conditions in this country. Sources of waste and how they can be reduced. The relations between forests and stream flow. The relation of forests to industry and civilization. What measures must be adopted to perpetuate our timber supply. Of the above, the annual cut is obtained each year by the joint work of the Census and Forest Service.

The entire subject of Minerals has been undertaken by the Geological Survey. The Commission desires to know, as nearly as possible, the amounts of ores and minerals in the ground. The amount mined each year, which is obtained annually by the Geological Survey. Probable duration of the supply. Nature and extent of waste in mining, extraction and use, and methods of preventing or lessening it. How the duration of these resources can be extended.

In addition to the above, the Commission seeks information on the conservation of life and property in mining; the losses by fire and their prevention, both of which subjects have been undertaken by the Geological Survey.

The Bureau of Statistics of the Department of Agriculture has furnished data concerning the losses among live stock by disease, exposure, etc.

The Fish Committee has furnished information concerning the annual catch of fish, the condition of supply, and the work or restocking.

The Biological Survey has furnished information concerning the condition and distribution of game, the annual destruction and natural increase, the useful and deleterious birds and mammals.

The Bureau of Entomology is preparing data concerning the damage done by insects to the forests, to crops, and to manufactured goods.

The Bureau of Statistics, Department of Commerce and Labor, sounds a note of warning to the effect that our exports of bread stuffs and meat have passed high-water mark, and will probably decline henceforward, as we consume more and more of them.

In much of this work the Census and the Bureau of Statistics of the Department of Agriculture have aided materially in mailing circulars and in receiving and tabulating the results.

Everywhere, throughout the government service, the Commission has found the heartiest and fullest cooperation. In most cases, the heartiness of the interest shown extended to a study of the inquiries and their emendation and extension by the chief of the bureau consulted, through his full knowledge of the subject. Moreover, in very many cases, the information sought by the Commission is precisely that which should have been obtained long ago by the bureaus concerned, but its collation has been delayed by the pressure of more immediate duties, and the bu-

reaus concerned have, therefore, welcomed this demand, as a reason for doing these things.

All this information is asked for by October 16. Some of it is already in the hands of the Commission, and it is believed that practically all of it will be in hand by that date. It will then be abstracted and from it a brief report will be prepared for submission to the Commission at its meeting on December 7.

A STUDY IN EROSION

Before these fields were shorn and tilled
Full to the brim our rivers flowed;
The melody of waters filled
The fresh and boundless woods;
And torrents dashed, and rivulets play'd,
And fountains spouted in the shade.

—*William Cullen Bryant*

PRODUCT OF IRRIGATED LAND
Hauling Sugar Beets to Factory, near Billings, Mont.

IRRIGATED LAND OPPORTUNITIES

By G. E. BROWNE

THE net profit of $500 to $1,000 per acre on fruit lands, and $50 to $75 per acre on alfalfa, rye, oats, and winter wheat lands, seems impossible. It looks more impossible when one travels for hundreds of miles throughout the western states and sees nothing but sage-brush lands surrounded by hills and mountains. The fact of the matter is, this land is worthless unless water can be applied. There are many hundreds of thousands of acres of irrigated lands that are settled upon, and many thousand acres that are being developed at the present time. There are also thousands of acres that will eventually be irrigated, but there are vast tracts that never can be, due to the fact that some land is not profitable to put water on, owing to the lay of the land, the rocks, and oftentimes the undesirable slopes. However, this latter class is also desirable, as it is exceptionally good in most cases for sheep and cattle grazing, and when these territories are located near irrigated tracts, the tendency is to keep the cattle close to where feed can be bought.

How can any person make a mistake by investing in irrigated lands? The average forty-acre tract in any irrigated district will yield as large a profit as 160 acres in the eastern or middle-west states. Most of the land being opened in Idaho, Wyoming, Colorado, and Montana can be bought for $35 per acre with water rights, and the buyer has from four to eight years to pay for the same. This is virgin soil, and the sage brush signifies that the land has never been robbed of any strength. The soil is exceptionally deep in the best irrigated tracts, and in two years with almost any crop, this land will pay for itself. With a small amount of money, any person can become independent in this new country, where the climate is ideal, and where there are more opportunities to the square yard than to the square mile in the East or Middle West. While fruit raising in the above-named territory has not been developed to as high a state, the possibilities are undeniable. It has been proven that all kinds of fruits except the citrus species thrive in the Northwest, and yield prolifically. At the present time the irrigated lands that have been put on the market recently, and settled, are put into alfalfa and grains, although there are many settlers who are also putting some of their acreage into orchard.

The Yakima, Wenatchee, and Hood River districts, and also the districts

near Spokane, are the great apple territories of the world. Fruit raising here is very highly developed and, in fact, the orchards are a wonderful sight. The orchardist has fruit raising down to a science. The fruit trees are held back from bearing until about the fifth year, and the trees themselves look far different from the scrawny and rank-looking apple trees that are found in the eastern states. The orchards are second only in beauty to the great mountains which surround them. While there are other tracts which yield great crops of apple fruit, the above-named districts have the reputation, and at the present time the growers here command the highest prices. All apples are packed in boxes which contain about a bushel. Before shipment is made, they are inspected by the Fruit Growers' Association, and it is a proud boast that there never has been a poor or wormy apple shipped from these best districts. The growers receive from $1.75 to $3.50 per box, and in the early spring commission men and buyers from all parts of the country come to these districts trying to contract for the fall fruit. The fruit raisers claim that $3.50 per box for the apples they raise is a low price, for all land which will grow this wonderful fruit commands a price of from $25 to $150 per acre before development, according to the location. With water this land is worth $300 to $400 per acre. This same land with fruit trees two years old will bring from $500 to $600 per acre, and bearing orchards, which are about impossible to buy at the present time, are held from $1,200 to $2,500 per acre. The first question any person will ask is "are not the values of the land too high, and is there not danger of an over-production?" From the closest study, there will never be an over-production of first-class apples, but where "seconds" are often raised and shipped, there may at some future time be a little over-production in this grade. However, at the present time there is no over-production in any grade of western apples. In the best or-

IRRIGATED LAND
Scene in Grand Valley, Colo., Showing Irrigated Crops

SCENE ON THE HUNTLEY PROJECT
Wool Going to Market, Billings, Mont.

chards, however, the growers try not to raise any "second" apples. By looking at the land values very closely, it is the general opinion that these same values which some people consider high at the present time, will increase each year. The demand for apples is growing, and especially so for the first-class No. 1 apple. Land that will grow this hardy apple is limited, so the orchards now bearing are conceded to be good investments. A greater part of the best apple orchards in the West are now productive orchards. However, the estimated increased production for the next four or five years will be about twenty per cent. per year. The demand in the last five years for first-class apples has increased thirty-five per cent. per year, so in comparing these two items it is certain that the demand will continue to increase over and above the supply. There is hardly a person that owns over twenty acres of orchard land, and very many tracts are divided into ten and five acre allotments, which clearly goes to show the great value of even a five-acre tract of this desirable fruit land

A HOMESTEAD IN IDAHO
Typical Rancher's House, on the Minidoka Irrigation Project

Potatoes in Young Orchard, Uncompahgre Project

At the present value of orchard land in Washington and Oregon, it takes a great deal more capital to make investments in this territory. While this fruit land is a wonderful investment in the above-named places, and while the apples raised here cannot be equaled in any place known, the prices of the land are somewhat too high for the class of American investors with a limited amount of money.

While Idaho, Wyoming, Colorado, and other sections where irrigation is carried on at the present time raise nearly any kind of fruit, their apples are not the hardy and keeping apple which is grown in Washington and Oregon. Elegant apples are raised, which are known as the "Christmas apple," but which after this season become soft, and have not the keeping qualities which make the northern

Apple Orchard, Uncompahgre Project

apples so famous. This is proven to be due to the mild climate the year round. The land values in these places will never reach the value of the northern fruit lands, but in comparison to the price paid for the land, any investments here are surely good. In the first place, land in Idaho and the surrounding territory, with water rights, is selling far below the same land in Washington and Oregon, and for that reason alone you cannot expect the high values. However, small fruit such as prunes, plums, grapes, cherries, peaches, pears, apricots, and most all berries, make an excellent yield. Sheep, cattle, and hog raising in this territory where grains and alfalfa are raised, is really the best and most profitable investment. Grains and alfalfa can be raised to great advantage, and are very essential to the sheep, cattle, and hog industry. Profits in fattening hogs and cattle are enormous. If the settlers do not own their own stocks, all their hay and alfalfa can be readily sold to the ranchers who occupy the hills and mountains during the summer months, and who are in the market during the fall for their winter feed.

The territory west of Colorado is in its infancy. People by the thousands are taking up land, there are opportunities in every line, and all the small towns are increasing in population and wealth accordingly. The people are congenial, and the life is ideal. There has never been an opportunity for a safer investment for a person with moderate means than at the present time in the great irrigated tracts in the West. The irrigation projects are for the benefit of the masses, and as each district is opened the land is taken up immediately by the people who realize and appreciate the great benefits that can be derived from its wonderfully productive soil. There are some irrigation projects which are not equal to others, but there is only one thing for

GRAPES ON IRRIGATED LAND

Small Vineyard on Payette-Boise Project, Idaho. Climate and Soil Well Adapted to Grape Culture

Irrigated Wheat Ranch in Colorado

people making investments to watch closely, and that is the water supply. This one thing is the all-essential for this land. Any one taking acreage should look at the water supply very closely, the reservoirs and the dams, and especially the flumes and ditches. The government has completed, and is now completing some excellent projects. Private corporations have done wonders for the country. A close observer will look to the supply of water, seeing that the same is ample at all times, whether it is from the mountain reservoirs or the rivers. One thing is certain, that there has never been a failure due to irrigation in the West. While I believe all the irrigating companies at

Irrigation Gardening in Montana

BLACK LOCUST TREES ON IRRIGATED LAND

Row of Three-year-old Trees on Payette-Boise Project, Idaho. Climate and Soil Seem Well Adapted to This Species, and Annual Growth Is about Five-eighths of an Inch

Typical Home on Irrigated Ranch in Montana

the present time are responsible, and in best shape for giving results to home seekers, there may be some projects in the future, due to some great boom, that will not stand the test. There are many acres of land that it would be utterly impracticable to put water on. The different ways of obtaining water are either by damming the rivers and raising the water to such a height that the same can be put on the land, or by constructing reservoirs in the hills and

Stacked Alfalfa on an Irrigated Ranch in Idaho

mountains to hold the water as the snow and ice gradually melts off the mountain tops. However, along the rivers there are a great number of tracts which obtain their moisture by pumping water from the streams upon the land. Probably one of the greatest irrigating systems in the West is in the Lewiston-Clarkston Valley in Idaho. In a portion of this valley the water is carried in pipes under the ground, and land is irrigated by turning hydrants and putting the water on in this manner. This is surely a very convenient and practical way, although the water charges are higher.

How Potatoes Grow under Irrigation in Colorado

Nearly every one visiting these different tracts, or hearing of the same, will ask, "how can they raise such large crops on this soil, and reap such large returns from a single acre?" In explaining this I will say that there is no excuse for crop failure. Excessive rains and floods never come; the sunshine, which makes all vegetation grow to the highest state of perfection where water is applied, is not interrupted by cloudy weather, therefore, your success is certain. All the land needs is water. They have the weather, the sunshine, and the soil, and by adding the water to these narrow valleys, which are merely pockets in the mountains, one can raise wonderful crops, and net large returns per acre. This is what makes even a ten-acre tract a priceless possession. The soil is a volcanic ash; it is very fine and compact, and there is very little evaporation from the same when water is applied. The irrigating or reclaiming the areas in the West has been going on for sometime. However, it never reached large proportions until the Reclamation Act was passed by Congress in June, 1902. Since that time the government has promoted some twenty-five or more projects, and thousands of people have made their homes on these lands, and still other thousands are moving to these new sections to reap the benefits which there await them. While you may say that the irrigation projects throughout the West are in their infancy, you will find that the simple irrigation projects have nearly all been taken up, and the gov-

ernment has been devoting its time to the more difficult engineering problems. As time goes on all irrigating problems will be more difficult engineering feats, and the area of land that will be put under water will be much less in acreage. Values will constantly rise, and while there are thousands of opportunities in the West at the present time, in a few years from now the same people that are investing at this time will see their land double and treble in value. The people in the East and Middle West are just beginning to realize these advantages and in one tract that was opened the first of June in southern Idaho, if every person had been given land that applied for the same, each would have received about four acres. This is one fact that goes to show the tendency of the times, and this same tendency is growing day by day, as the people are becoming familiar with western possibilities.

IRRIGATED SHEEP RANCH

Feeds 17 Head per Acre, and Could Support 23 Head. Payette-Boise Project, Idaho

THE CHAUTAUQUA AS A PROPAGANDA MEDIUM

By THOMAS ELMER WILL

A WORD as to the Chautauqua as a medium through which to reach the people with the truth The American Forestry Association desires to propagate.

The Chautauqua Assembly was founded in 1874, largely through the efforts of Reverend, now Bishop, John Heyl Vincent at Lake Chautauqua, New York.

Like many other good things, the Chautauqua, both as an idea and an institution, grew. Chautauqua literary and scientific circles were established throughout the country. In these, students pursued courses of reading, culminating with academic degrees. Increasing multitudes made annual summer pilgrimages to the home of the institution, Lake Chautauqua.

With the growth in numbers, however, came increasing difficulty for Chautauqua patrons to avail themselves of the advantages of the great parent assembly. In time was born the idea that, instead of making it necessary for the mountain to come to Mohammed, Mohammed should go to the mountain. In other words, local Chautauqua assemblies were established at various points throughout the country.

The writer well remembers attending one of these little, local Chautauquas which had pitched its tents and tabernacles in a canyon of a pioneer settlement in north central Nebraska about 1890. Distinguished clergymen, lecturers and teachers were brought many hundreds of miles, and gave to the people there clustering on the very edge of civilization the best thought and highest inspiration of the more populous centers. For a number of years, this local Chautauqua was one of the great features in the life of this community, and was talked of from its adjournment one year to its assembly the following year.

Such local Chautauquas multiplied. They now flourish, especially, in the territory between eastern Ohio and Colorado. Winconsin, Minnesota, Iowa, Nebraska, Kansas, and Missouri are among the leading Chautauqua states.

Local Chautauquas have, in cases, organized permanently, bought land, and erected tabernacles for assembly purposes. Like theaters and schools, they now constitute a regular feature of the entertainment and educational life of the communities in which they are found.

Quite recently the Chautauqua has made a new departure. Its organization and ownership have become not local but central; instead of being fixed to one spot, it travels, like a circus.

The type of this latter form of Chautauqua is the Redpath Chautauqua System. It experimented with the new plan in the summer of 1907; it developed it to large proportions in the summer of 1908. During the past summer the Redpaths maintained six Chautauqua outfits, each comprising a crew, railway car, large assembly tent, and smaller tents. The institution is owned by the corporation known as the Redpath Chautauqua System. Crew, car, and tents were, in each case, in charge of a superintendent. They went into a town on Monday, operated six successive days, morning, afternoon, and evening, and then moved by rail to another town where they repeated the process and, to a greater or less extent, the same program. Certain speakers and teachers stayed with a given tent through the season, meeting practically the same audience daily for six days. Another type of speaker, however, spoke on Tuesday at one Chautauqua, on Wednesday at another, and so on through the week, oscillating back and forth among the six Chautauquas, perhaps for several weeks; in cases, throughout

the entire season of eleven weeks. He might give the same lecture or entertainment at each point visited, or he might vary it. The season began at Winona, Minnesota, on June 16, and ended at Salisbury, Missouri, on August 30.

Continuing eleven weeks, and serving six towns per week, the Redpaths held sixty-six Chautauquas in the summer of 1908. Of these, two were in Wisconsin, six in Minnesota, nineteen in Missouri, and thirty-nine in Iowa. On rare occasions, a session was broken up by a violent rainstorm. As a rule, however, eighteen sessions were held in each town visited. Tickets cost $1.50 each. Single admission was charged for at a higher, variable rate.

The writer began at the beginning and stayed to the end of the Redpath season. He visited each of the sixty-six towns and spoke at sixty-four. At two, Dubuque, Iowa, and Savannah, Missouri, though present and ready, he was hindered from speaking by furious rainstorms. He carried with him a handsome set of slides and a first-class lantern and outfit. He was accompanied by an operator, who attended for the most part to lantern, curtain, baggage, and the like.

The audiences addressed at these sixty-four meetings were conservatively estimated at about 1,000 each. In addition, much space—commonly from one column to two columns—was given by the local press to reports of the lecture on conservation. Thus the number reached through the press was probably very much larger than the number reached in the tents. Marked copies of papers reporting the lectures were also quite commonly sent to the representatives and senators of the states in which the lectures were given. To most of the hearers, the subject of general conservation and even that of forestry seemed practically new. Earnest expressions of approval were, however, constantly heard, some auditors declaring the conservation lecture to be worth the entire price of the one-week season ticket to the Chautauqua.

Among the speakers with whom the writer was privileged to associate on this tour may be mentioned the Rev. Samuel Parkes Cadman of Brooklyn; Dr. John S. Carson, of Brooklyn; Hon. David A. De Armond, congressman from Missouri; Judge Lee S. Estelle, of Omaha; Thomas Brooks Fletcher, of Cleveland; Rev. Samuel Garvin, of Kansas City; Dr. Thomas E. Green, of Chicago; Gov. Warren G. Harding, of Ohio; Gov. E. W. Hoch of Kansas; Capt. Richmond Pearson Hobson, of Alabama; Judge Ben B. Lindsey, of Denver; Mr. George L. McNutt; Opie Read, of Chicago; Senator Robert L. Taylor, of Tennessee; and Dr. E. A. Winship, of Boston. A majority of these men spoke in high terms of the importance of the writer's mission. An officer of the Redpath Chautauqua System said the lecture was the type of what, in his judgment, was ideal Chautauqua work—solid instruction on a vital theme, combined with a measure of entertainment.

As a medium for presenting forestry and allied truths to the ear and eye of the people who make up the bone and sinew of the common life, the Chautauqua has no equal. A certain contingent comes merely to be entertained, and may not stay to the end of a solid lecture. The great majority will, however, listen intently to every word. Seed may thus be sown which will, in time, bear a rich fruitage. Hence, no more important work could be done by the Association than to cultivate the Chautauqua field.

In closing, the writer may mention a personal experience. On August 25 he spoke at Carrollton, Missouri, the county seat of Carroll County. As a boy, he had lived in that county, and now returned to it for the first time in thirty-one years. With feelings probably similar to those of Goldsmith, author of "The Deserted Village," he visited the home of his childhood, to find it reduced to a corn field; one of the few traces still remaining of the old home site being the newly-made stump, over three feet in diameter, of a magnificent maple tree planted by his father nearly forty years ago.

Cemented Cavity

TREE SURGERY AS A SCIENCE

By MARTIN L. DAVEY

Davey's School of Practical Forestry

Cavity Healed

TO HIM who has seen the glorious health of trees in the wild woodland, where nature is the caretaker, the necessity for a science that deals with the weaknesses and infirmities of the individual tree may come as a great revelation. He sees the vigorous trees survive, and the weak ones perish, and he conceives the idea of the "survival of the fittest," from which he concludes that when a tree dies, its death is inevitable. Though erroneous, the conclusion is a natural one, and it is not until he has seen the decline of some favorite tree, one, perhaps, that has shaded his home for generations, that he wonders what might be done to save it.

The care of trees is not new. In a crude way, it has been practiced for centuries; and it remained crude until about half a century ago, when the science of tree surgery was conceived.

Like all the movements that have sprung into being, tree surgery is the result of an idea. McCormick felt the pulse of the farming industry, and it was slow. He recognized the great need of labor-saving machinery and he set to work to meet that need. Then came his reaper, which soon demonstrated its possibilities. Its advent quickened the agricultural pulse, and with other similar inventions has served to raise the business of farming to its modern plane of a science.

In like manner, tree surgery was developed. Some fifty years ago a young man breathed the inspiration to leave the old English farm where his early years had been spent, and find his life's work among trees and flowers. After the customary careful manner prevalent there, he served his apprenticeship in one of the large English nurseries. Not long after this he felt the call of the New World, and making his way hither, settled in a little town in Ohio. There his work with trees began in earnest; but, in following the course of his training, he recognized its limitations, and set about to remove them. The young man's name was John Davey, and his were the ideas which have so completely revolutionized the methods used in the care of trees. It was evident to him that the ordinary methods were not sufficient. Trees were rapidly going to pieces; their lives were shortened by adverse circumstances; "tree-butchers" were everywhere; ignorance of tree life was almost universal. But the worst trouble was that the people hardly realized the seriousness of the situation. To them a tree was almost an inanimate object—a mere feature of the landscape, like the little brook that rambled through the fields, or the lofty cliff that jutted from the mountain side; a thing that existed rather than lived.

But the tree lives, thought Mr. Davey; it has a life as real as our own, subject to certain fixed laws, which, if recognized, will insure its health, and lengthen its life, but which, if violated, will bring about its decline and premature death.

It is truly fascinating to study the principles which govern the life of a tree, and the conditions under which it

thrives or decays. In the tree there is a circulation that is as real and vital, and necessary to its existence, as that in the human body. The tiny feeding rootlets take up the liquid food from the soil, and send it up through the cells of the wood fiber to the leaves, where it is transformed into the tree-food, and returned under the bark, in what is known as the cambium layer, building as it goes, and finally again reaching the little rootlets that are so necessary to the life of the tree. The tree breathes; it breathes through its leaves, and through its bark, and through its roots. It has its time of rest and activity. There is a wonderfully interesting reciprocal relation between the roots and the leaves. The roots are the organs that take up the food, and the leaves are those that digest it. If the roots are healthy there is plenty of food to digest; and if the leaves are healthy, there is an abundance of material from which to build. Each is dependent on the other; if both are healthly, the life of the tree is vigorous, but if one is destroyed, the other perishes. The transformation of the sap into tree-food is extremely interesting. This takes place in the leaves, where the sap is spread out to the action of the sun and the atmosphere. The oxygen, which is so necessary to our existence, is exhaled, and the carbon dioxide, so dangerous to human life, is absorbed and combined with the elements in the sap, to make the food with which the tree builds.

A TYPICAL CAVITY
Cherry Tree on Estate of W. B. Thompson, Yonkers, N. Y. Note Front and Rear Openings

With this understanding of the principles involved in the life of the tree, let us consider the troubles that arise from their violation, and which it is the business of the tree surgeon to remedy. In general, they include the following: cavities, splitting crotches, dead branches, destruction of the roots, and unfavorable root conditions, insect pests, and general diseases, fungus growths, gas and electricity, clinging vines, the over-thickness of the top, interfering branches, lack of sunshine, and other conditions unfavorable to the leaves.

A TYPICAL CEMENT FILLING
Same Tree as Above. Contour of Tree Preserved

Perhaps the one deserving first consideration is the cavity and its treat-

ment. The causes which produce cavities are almost innumerable, but the most common are the following: improper trimming, splitting of weak crotches, gnawing by horses, bruises caused by lawn mowers and other implements, the raising of the bark by lightning, and, not infrequently, the lacerations caused by the climbing-spurs used by telephone men, and, sad to say, by the ordinary "tree-butcher." It may safely be said that as long as the bark, including, of course, that on the roots, remains perfectly sound and whole, there will be no cavities; therefore, whenever the bark is destroyed and the wood fiber is left unprotected, there will be a cavity. Fully half the work of the tree surgeon is undoing the damage that some one else has done. One of the worst troubles which he encounters is the result of improper trimming. When the average man cuts off a limb, he generally does so where the diameter is the smallest, necessarily leaving a stub; or he may leave the stub under the impression that the decay will be so much the slower. And in those rare cases where the cut is made properly, it is seldom that he uses any precaution to keep the wood from decaying while the bark is healing over the wound. All cuts should be made flush with the limb or trunk from which the branch is taken; but, in order to understand the reason for this, it is necessary to take into consideration the circulation of the tree, and the way in which it heals. As a matter of course, where there are no leaves there can be no circulation; and where there is no circulation there can be no healing. Where the end of a limb is taken off, the circulation is destroyed in that part of the tree, the bark dies back to the main limb or trunk, and the stub decays till it falls out and leaves a cavity. The same thing is true when the top of a tree is cut back improperly. The stubs invariably decay, unless the cut is made down close to a good, live branch, sloping away from that branch, and protected by some method of waterproofing.

The method of treating a cavity, as devised by Mr. Davey, is extremely comprehensive. It is based on exactly the same principles as those of dentistry. First of all, the decayed matter is carefully removed back to good, healthy tissue. The walls of the cavity are then thoroughly water-proofed and studded with nails driven in, which serve to hold the filling firmly against the sides. Drain-tubes are always put in at the bottom of the cavity, extending to the outside of the tree, so that in case water gains entrance from any unforeseen cause, it may be carried off, and the cavity remain dry. Wherever the tree is especially weak because of the cavity, steel braces, both longitudinal and transverse, are put in for the purpose of reinforcement. Water-sheds are invariably used, to keep the moisture out; these consist of deep V-shaped grooves extending from the inside of the top, along both sides of the mouth of the cavity, and out at the bottom, over a ledge that slopes upward and inward. Then the filling of

A WATER-SHED
Ash Tree on John D. Rockefeller Estate, Tarrytown, N. Y., showing Water-shed around Cavity

cement is put in and tamped into place; and after it has set sufficiently, it is shaped in such a manner as to preserve the contour of the tree, and permit the bark to heal entirely over it. In some cases the extra precaution is taken of placing a zinc cap over the cement, fitting it inside the edges of the bark.

The thoroughness of this method is at once apparent, and the thousands of trees which have been thus treated bear eloquent testimony to its effectiveness. How striking, then, is the analogy between this method of treating a cavity and the modern system of dentistry; both are based on the same three principles; the decayed matter must be entirely removed; the cavity must be prepared in such a manner that the filling will stay permanently in place; and moisture and all foreign substances must be absolutely excluded. This method is a striking improvement over the antiquated system of merely cleaning out a cavity superficially, and tacking over the outside a piece of tin, which, though less expensive, was only a temporary makeshift, quickly corroding and tearing loose from the tree as it swayed in the wind, and leaving the cavity open and unprotected as before. Think of a dentist simply placing a piece of tin over an unfilled cavity in a tooth!

It was once thought impossible to render the filling of a cavity permanent and effective; this idea was based on the supposition that the growth of a tree was on the inside, and that in consequence the cement would eventually be forced out. But as a matter of fact there is absolutely no growth on the inside of a tree, which acts as a physical support. The entire growth takes place immediately under the bark, and if the filling is properly put in, so that it is entirely inside the growing tissues, the bark will heal completely over it, eventually encasing it within the body of the tree.

Another very common trouble which the tree surgeon meets in his work is

THE RESULT OF NEGLECT
Weak, Unsupported Crotches Are Dangerous. Loss of Branch Destroys Symmetry and Beauty of Tree

the splitting crotch, which to his skilled eye often presents a serious danger which the casual observer would never suspect. It is perfectly natural for the weak crotch to exist in some trees; the varieties most subject to this weakness are the elm, the soft maples, the linden, and the beech. It is sometimes found in other varieties, but more seldom. It may be caused by cutting back the leader and forcing out the two lateral buds when the tree is young. Its heavy winds and the consequent admission of more water. All this while the tree continues to heal on the outside, making the pouch more extensive. The operation continues until one of the branches becomes too heavy to be longer supported, and is torn off in a windstorm. The method devised by Mr. Davey for the treatment of such cases is most effective. It consists of the chain and lag-hook, with the addition, in serious cases, of a double-

THE CHAIN AND LAG-HOOK SYSTEM
Weak Crotches Made Secure. Maple on Estate of George Lauder, Jr., Greenwich, Conn.

treatment is complicated, and demands the utmost care, especially in the advanced stages. When the limbs have attained a sufficient size and weight, the swaying in the wind causes a slight splitting between the diverging branches. Water is thus admitted and starts the process of decay. Although the tree seeks to protect itself by healing over the outside of the crack, it merely forms a pouch for the water, and the decay continues with increasing rapidity, because the tree becomes weaker by the repeated splitting in the headed bolt between the branches, and bolts through the sides of the water-pouch. The chains and lag-hooks are used in many cases for their preventive value. It is invariably the rule where trees of this kind are treated, to tap the pouch between the limbs, and preserve an opening by means of one or more drain-tubes. The split itself is caulked in such a manner that the bark will heal over it; however, it is sometimes necessary when the split is very bad to excavate as with other cavities and fill in the same manner, although

this is an extremely critical undertaking.

The roots of the tree must receive careful consideration. The general health of the tree will also indicate the health of the roots. It is too often true that in carrying out landscape designs the roots are cut off, and the tree left high and dry. The death of the tree, or at least of part of it, is under these conditions inevitable. Or it may be that the roots have been buried; which is just as sure to cause the destruction of the tree. It is absolutely necessary that the roots of the tree receive air and water and nourishment, as it is for the human body. It may be that the tree has become sod-bound, which produces the same result. In order to take care of these conditions, the proper method is the digging of a circular trench out under the edge of the branches, making it as the occasion may require, from three to six feet deep by about two wide. In this trench tile is placed for the purpose of aeration and watering. The trench is then filled with a mixture of good, nourishing tree food. In this manner it is often possible to save both the sod and the tree.

The question of insect pests and general diseases, including fungus growths, has been so thoroughly discussed by all the government and state authorities that it is hardly necessary to do more than mention it in passing. However, it is of the utmost importance to give these matters consistent and careful attention, especially as regards spraying.

The evil effects of electricity are noticed only at infrequent intervals. But the escape of gas in the soil is most deadly. Its presence for any considerable period means certain death for the tree, and the only possible way to remedy the trouble is to stop the leak, remove all the poisoned soil, and replace it with good rich earth.

Vines in most cases, after they have attained to any size, are detrimental to the health of the trees, and the skilled tree surgeon will almost invariably recommend that they be destroyed, unless the tree itself has gone too far to be saved. In many cases the top of the tree is altogether too thick, and must be thinned out to produce the best results. This is especially true in the case of fruit trees. Interfering branches must be removed or else bolted together so that they cannot rub, as the chafing of the branches invariably destroys the bark, and decay is the result. Trees are often planted too close together, and this results either in the stunting of the weaker ones, or a lack of symmetry in all.

In all life, health is the normal condition. Nature designed us to be well, and the laws which govern life are simple. At the same time, she attaches severe penalties to their violation; and these penalties, unchecked, mean decline and death. It is just as true with the tree as with human life; to meet success, one must know the laws of nature, and act in harmony with them. Ignorance or disregard of these laws are evident wherever the unskilled hand touches a tree. Why should a tree die at fifty years, or a hundred years? It cannot be called old, when there are other trees of the same kind, ranging in age from 300 to a thousand years; and there are trees in existence which have reached 5,000 years or more. To the average man the life of a tree and the principles which govern it have been a sealed book; and we have permitted neglect and abuse to be heaped upon our trees which we could never be persuaded to tolerate in any other living thing. The need for the tree surgeon is apparent; the good which he is accomplishing is immeasurable; and the calling ranks in nobility with those other great sciences which have for their province the betterment of life in whatever form.

VIEW IN SIERRA NATIONAL FOREST

Kern River Canyon, about Four Miles below Little Kern Lake, and near the Mammoth Power Project of the Edison Electric Company

A BEGINNER IN FORESTRY

BY ANNE WARNER

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Paper 1

I AM very ignorant, but I am going to learn. There is always something interesting in the ignorance of those who intend to grow wise. Those already wise are interested because they are conscious how much is to be learned; and those equally ignorant like to observe the struggles of their fellow in evolution. Therefore, I am going to write out the steps—the first steps—of my own personal progression. Perhaps it will amuse the ones who know it all anyway, but it is not for them that I shall trouble to write; it is for the others—the others who know no more than I do myself (at present). I shall write for them in the hope that they, too, may be led to learn.

In the first place, then, I must begin by telling where I am to go to school. Lichtenberg is the place, and it is paradise. When I came abroad to look for a place in the country, yet near a town, where everything should be pure country, except that there must be all the comforts of town, where I could have plenty of rooms and yet not be charged over three shillings a day, and where there must be a forest handy—well, no one thought that I could find it. I hunted from Berlin to Munich, and even farther, cross-country, and I found it—as I never doubt that I shall find anything if I set out to look for it.

The Gasthof lies in the edge of the Harz; the view from my windows is over a sea of cultivated fields, dotted with fifteen picturesque little villages; the comforts are all here, the beer is ideal, my stove is equally good, and the forest is so close that when we cross the road behind the house we enter it at once. "We" are "She" and I. "She" is a wood-fairy and all the teacher that I have so far. The forester is in Thuringia for a fortnight—whes he comes home he will teach me gladly. Until then I have a German lexicon, and as it doesn't give pictures of the leaves, and does give all the names in Latin, it is very little good to me.

You are to understand that I am well grounded in the theories and ideals of the subject. I know all its bearings on history, commerce, and progress. I have learned by heart all the deficiencies of bad management and just what

is bound to occur if we don't stop and think. I know all this quite well. But it is of the forest out there on the other side of the road that I am ignorant. I spend hours in it daily, and we strive like two untrained deaf mutes to make out something of one another's meaning, but I cannot understand.

Why, in the middle of the mile of mixed trees, do we find a whole hillside of pines? Is it true that the moss under the pines is different from the moss under the mixed trees, or do we only fancy so, or is it only accident? Is there a rotation in crops with trees, or why, when there is not one oak in the forest, did they plant the whole last clearing to oaks?

The roads are splendid in every direction; they are of broken rock, with sand and gravel crushed in with a road-roller. The underbrush is all cleared out, and the carpet of dead leaves is only broken by patches of moss. The prettiest mushrooms grow everywhere; some are exactly like edelweiss, and some are pink. There are pink-shelled snails, too, and great red snails without shells. The fairy very justly observes that when one goes barefoot she notices snails and mushrooms much more than when wearing shoes. What I notice more than anything else is the unspeakable order of it all; not a dead tree, not a broken branch—all is so quiet, so still, so clean.

For miles along these hills it is all "planted wood," as the Germans say, and all is in the same order. And yet one rarely sees a workman. Deer, yes, and rabbits often, but hardly ever a man. Perhaps in August there is no need to give the trees attention—that is another thing that I must learn.

There is one very interesting tree among them all. In the midst of the forest, on the crown of the ridge stands a ruined castle where Barbarossa and all the rest have often come and gone. Mausfield besieged it and took it and wrecked it, and on the mounds of its ruin very large trees have grown and been cut down. But the strangest tree of all lies across the way from the old entrance. I thought at first that it was a mound with trees growing upon it, but the fairy pointed out to me that the mound itself was a tree, vast and hollow. Around the top of the hollow the old shell bunches, as if to cover some sort of ancient scars, and out of each bunch springs a thriving tree, six to ten inches in diameter, which seems in some odd way to serve itself through the medium of the roots of the old stump. It is so odd. One sees willows do something like this, but this tree is not a willow. I don't know what it is.

Oh, I have much to learn. Even this huge old tree must have its lesson when I can read it. I want so much to learn. I sympathize as I never did before with Alfred the Great. And *he* learned.

(*To be continued*)

OUR WANING COAL SUPPLY

By GEN. A. WARNER

EVERY man of intelligence and any scientific knowledge must agree with the President in the supreme importance of preserving our natural resources; and this importance was last spring emphasized by perhaps the most celebrated gathering ever assembled at the White House. It seems to be conceded that first in importance of our natural resources to be preserved are our forests. It is, however, to the extent and rapid exhaustion of our coal fields that the writer wishes especially to direct attention. Many years of the earlier life of the writer were spent in geological examinations in the Appalachian coal fields, from northern Pennsylvania through West Virginia, Ohio, Kentucky, Tennessee, and Alabama, following the line of the earlier investigations of H. D. Rogers in Pennsylvania and William B. Rogers in Virginia. The great reports of these two early geologists have been the foundation of all later surveys. Later the writer became interested in different sections of this greatest of coal fields, by extensive drillings and shaft openings, and early came to the conclusion that the number and extent of the workable beds of coal in nearly the whole of the Appalachian field had been greatly over-estimated.

Later examinations by eminent geologists confirm this view. Prof. I. C. White, state geologist of West Virginia, in his excellent report on the coal deposits of that state, cuts down previous estimates of the area of workable coal from 15,000 square miles to possibly less than 10,000, and limits the area of the greatest and most valuable beds of coal perhaps in the United States, namely, the great Pocahontas and New River beds, to 600 to 700 square miles. Again, the extensive drillings that have been made in recent years show that in reality the valuable coal beds throughout the most of the Appalachian field are actually contained within a marginal belt from twenty to thirty miles wide on the eastern and western sides of the field in the states of Kentucky, West Virginia, Ohio, and the western side of Pennsylvania, a large elliptical area within these limits containing no workable seams of coal. The western side of the field in Pennsylvania embraces the Monongahela and Conemaugh series, and contains, in the Laurel Hill and Chestnut Ridge synclinals, perhaps an exception to this structural limitation of workable coals. But it is nevertheless estimated that the soft coking coals contained in these synclinals, and westward in the Pittsburg seam, will be practically exhausted in twenty-five to thirty years; certainly in less than fifty years at the present rate of consumption.

If the Appalachian basin is viewed longitudinally any geological map will show that it narrows down as it extends into Tennessee and Alabama, and in Tennessee is diveded by an anticlinal ridge formed by an uplift of lower limestones, which divides the coal area into two or more basins and limits the area of coal.

The question of the thickness of the coal measures and the number of workable beds is of the greatest importance. If a vertical section could be made that would expose to view the thickness of each of the five great divisions agreed upon by the later geologists—the Dunkard on top, the Monongahela, carrying the great Pittsburg seam, the Conemaugh, the Allegheny, and the Pottsville, down to the floor of the whole

basin it would be easier to see how the coal measures are divided vertically as well as longitudinally. In such an exposure it would be seen that only the lower beds, or those contained in the Allegheny and Pottsville divisions, extend into Tennessee and Alabama; it would also show that but few coal beds extend evenly over wide areas, an exception being the great Pittsburg seam. It would also show that good seams of coal are seldom found side by side, or layer upon layer in the same section. But let us come to the main problem. How long will it take to exhaust the several parts of these fields? Beginning with Alabama: At the rapid rate at which the coal in this valuable field is being mined, there cannot be much left in forty years, and yet a senseless clamor is made to have certain rivers improved so that this coal can be shipped out of the country! Considering the relation of this coal to iron ore that will last probably 150 to 200 years and perhaps longer (as one is known to extend all through the Clinton formation) the shipment of any of the coal out of this field ought to be prohibited by law. Tennessee has less coal in quantity; but being for the most part of good quality, it is being rapidly mined by the Tennessee Coal and Iron Company for its own use, and by numerous other companies for the general market, and twenty-five to thirty-five years will see but little left, and long before that time the price will have advanced to the monopolistic limit.

It is then, to the coals found in the upper series in Kentucky, West Virginia, eastern Ohio, and Pennsylvania that we must look for our supply in the later years of the century. But when we see how rapidly certain of these coals—the Pittsburg, the upper Freeport, equivalent to the Cambridge of Ohio, and what is left in veins in the Pottsville series in Ohio and Pennsylvania—are going now by lake and rail to supply the demand in the North and Northwest, it really becomes an alarming problem to determine what even the next generation will do for fuel.

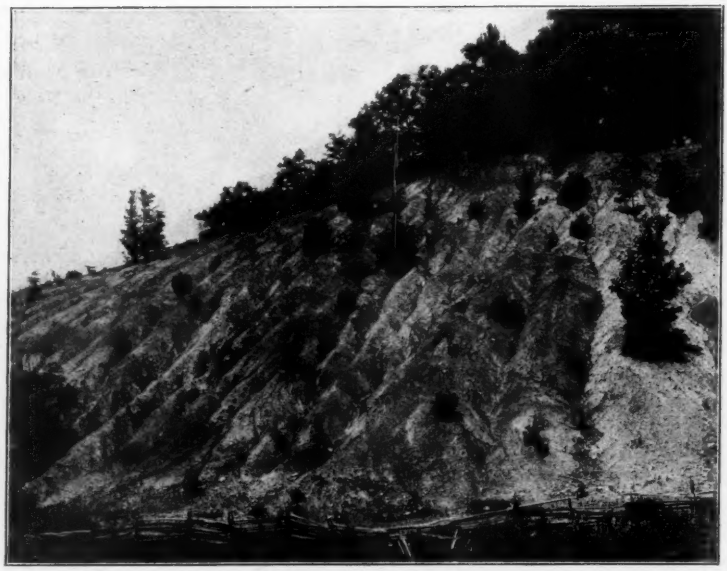
The coals of Indiana and Illinois are all needed in the Middle West, and will be mined out to supply these markets before the century is half out.

But let us turn again for a moment to the 600 to 700 square miles of the Pocahontas and New River beds and see what is going on in this, the most valuable part of the Appalachian field, and all told, perhaps more valuable than any other, even than the anthracite field. Already this coal is being shipped as fast as trains can carry it to different parts of the country, and to the Atlantic coast, to supply, not only our own navy, but the navies of other countries, and to supply the markets of the world. And now new railroads are being hurried into the field to compete for this traffic. How long will the field last under these conditions? One item will shed light on this question. The large steamships that now ply the ocean use approximately 100 tons of coal an hour, or over 2,000 tons a day, or 10,000 tons in crossing the ocean. An acre of coal will afford on an average 1,000 tons for every foot in thickness, or 4,000 tons for a vein four feet thick, which is rather over than under the average thickness in the New River field. The rest is a matter of computation. Why, then, should there be such a rush to get this most valuable coal out of the United States?

Turning to the anthracite field, it is well known that at the present rate of exhaustion, there will be little of this field left in fifty years, and long before that time the price will almost certainly be whatever the owners of the field agree on. What will Philadelphia New York, all New England, all the eastern part of the country, then, do for fuel? They cannot hope for relief from the Appalachian field, for there will be little left to draw on from there. And yet to so momentous a question, 999 persons out of a thousand will answer: "That is as long as I shall live." In the language of Puck, "What fools these mortals be."

I do not touch upon the great fields in Wyoming and other mountain states, as these fields have not yet been thoroughly surveyed, and these coals can hardly come to eastern markets.

There is another most important phase of the coal question that has heretofore received all too little attention, and that is the reckless and wasteful way mining in all fields is carried on. Under present methods only from two-thirds to three-fourths of the coal is taken out. The rest is left in the mines as pillars, or otherwise. From twenty to forty cents a ton more, while the field is being worked, would save practically all the coal. But for manifest reasons this cannot be done in one field alone. Legislation is required to stop this waste of a substance without which man cannot live. And the legislation must come from many states at the same time, or from the United States.



THE EFFECTS OF EROSION

Denuded and Washed-out Slope in Western North Carolina

WATER-POWER DEVELOPMENT

Cotton Mills at Columbus, Ga., on the Chattahoochee River

THE WASTE OF THE FIELDS

Silt Bar Deposited on the Banks of a Navigable Stream. Washed Down by Floods rom the Fields, and Must Be Removed by Dredging. Mississippi River

APPALACHIAN NATIONAL FOREST ASSOCIATION

TWO important meetings have been held by the Association during September in the inauguration of its plan to obtain an active membership; one in Lynchburg, Va., on September 17, and in Richmond, Va., on the 22d inst., in both places before appreciative and earnest audiences. These meetings are deemed by us of great importance, because they are considered by us as demonstrating, not alone the interest of the people in the forest cause, but as proving the practicability of our plan for obtaining a membership made up of organized clubs, etc., already equipped for work as it were, and, therefore, capable of giving influential and aggresive aid to our campaign. They show that our plan for organizing a branch of our Association in each southern city is practical; they show that these branches can be better organized into a State Forest League; they show that the people are keenly alive to the vital questions which are involved, and most clearly of all show that the earnest and thoughtful man and woman, want to be put to work on some practical lines that will accomplish results.

The Lynchburg meeting was held under the joint auspices of the Lynchburg Board of Trade, Woman's Club. Retail Merchant's Association, and Civic League. It had been thoroughly advertised by the energetic and capable Secretary of the Board of Trade, Mr. J. A. Faulkner, and a representative audience assembled at the Y. M. C. A. Auditorium to greet Mr. Fred G. Plummer, of the Forest Service, and Mr. John H. Finney, Secretary of our Association. Mr. Long, a prominent Lynchburg attorney, presided most capably.

Mr. Plummer dealt with the work of the Forest Service and its administrative features, illustrated by beautiful lantern slides, it was a running comment on conditions and practices, and was most entertainingly presented and enthusiastically received. Mr. Finney dealt with the need for forest extension by the government, along the lines of a definite forest policy, urging of course, the acquisition of the Appalachian and White Mountain area, as of supreme importance, and then taking up the state work that must be done in cooperation with the government and with individual owners, told graphically the plans of the Association for furthering the work.

His address also covered the history of the fight for this Appalachian forest, and vigorously scored the politicians who have heretofore prevented action by Congress. At the conclusion of the speaking, the audience unanimously passed a resolution endorsing the work of the Association, pleading its cooperation, and the four organizations voted to join the Association in a body.

A particularly gratifying result was the gift by Mrs. Cora L. Mosby, of Lynchburg, of fifty acres of land as the beginning of the "Virginia State Forest."

From this gift, we feel, must come large results, for we are convinced that there must be other patriotic women and men in Virginia whose generosity and patriotism must get stimulus and inspiration from this gift to her state by a noble woman.

The Richmond meeting, held under the Chamber of Commerce in their assembly hall, was equally interesting and instructive.

Mr. Henry W. Wood, the vice-president of the Chamber, presided, and eloquently presented the subjects and the speakers, Mr. F. G. Plummer, and Mr. John H. Finney. The subjects chosen by the speakers were the same as in Lynchburg, and were ably handled, to the enjoyment of the select audience present.

The papers had given much space to the meeting, and strong editorial comment made both before and after the lectures on the importance of the subject.

Among the audience, was Congressman John Lamb, a member of the Agricultural Committee of the House of Representatives, who briefly followed Mr. Finney in a speech which severely "roasted" Speaker Cannon, declaring that the movement for the acquisition of the Appalachians had been blocked by his committee appointments. "Uncle Joe did it," he declared, "but the time will come when he won't be there." Captain Lamb strongly endorsed the speeches of Mr. Plummer and Mr. Finney, reminding his hearers that the work was not only one for the present, but for the good of posterity.

Resolutions were unanimously adopted endorsing the Association and pledging to its aid the Chamber of Commerce, Business Men's Club, Woman's Club, the Civic Improvement League, and the Traveler's Protective Association.

The Association has planned similar meetings, probably handled by the same speakers, at Danville and Roanoke, Va.; Winston-Salem, Charlotte, Greensboro, and other North Carolina points; Rome and Athens, Ga.; Montgomery, Ala., etc., and is almost daily in receipt of requests for speakers.

It is naturally a tremendous work, one that we feel we must continue; but it is work that must have, to be successful, the individual conscience of our membership. We feel that the influences which these meetings are enlisting and setting in motion are to result in large consequences—for the good of the whole Nation. We are beginning, as a people, to understand the need of the forests and the vital concern of the individual in their proper conservation. Such costly object-lessons as the recent floods in the South; the present costly forest fires in all sections of the country; the existing drought conditions in Pennsylvania and adjoining states, vividly portray the future of America without its forests, and tell the story, appalling though it be, more eloquently and more forcibly than any words of ours.

Once get the thinking man or woman educated to real conditions and to the necessity of work on his or her part, and the blind indifference of Congress and the opposition of the Speaker and his committees will be swept aside with a force which cannot be gainsaid, and the forests shall be saved.

We are, indeed, "pledged to the Forest Cause."

THE APPALACHIAN NATIONAL FOREST ASSOCIATION.

EDITORIAL

The Business Side of Conservation

IT IS a fact not readily understandable that the preservation and conservation of our natural resources has not, heretofore, seemed to have any particular appeal to the mass of business men of the United States. In fact, it is true, and has been true for a great many years—ever since the inception of the conservation plan as applied to our forests, in particular—that college-bred men, scientists and the like, have waged the battles, while hard-headed, practical "men of affairs" have jeered and obstructed. Of course, this is not universally true; but as a general proposition it cannot be gainsaid. College professors, men of science—the class of men for whom your average "business man" has a hearty and ill-concealed contempt—have been the ones to tell the world what will be the inevitable result if a continuance in the course of reckless waste and extravagance as regards timber, etc., unless their warnings were heeded; the men who "dream," as the hard-headed ones declare, have for years and years been telling these "practical men of affairs" to what they were coming, and to what they were bringing the land, by their "practical" exploitation of all of nature's resources. It is a healthy symptom to see that these same practical men are beginning to realize that the dreamers dreamed true; and it augurs well for the cause of conservation in general to know that at last the business sense of the country has been awakened.

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As a Money-saving Proposition

LOOKING at the matter solely from the practical side, the grossly material view-point, it seems strange that this awakening has been so long deferred. For instance, Pittsburg has for years been subjected to disastrous annual floods, during which the business section of the city, and Allegheny, have been laid waste and prostrated under sweeping torrents of water from the Ohio and the Monongahela and Allegheny rivers. At any time it would have been entirely practicable to do away with the flood visitations; at any time in the past quarter century it would have been an easy matter for the business element of Pittsburg to secure legislation looking toward the reforestation of the watersheds of these rivers; at any time in that period it would have been easy for this business element to pave the way for the inauguration of a policy of reservoir building, the damming of valleys and the storage of flood waters that have been wasted—worse than wasted, indeed, because of the millions of dollars of damage these waters have done. But no; the business element taking the fatalistic view-point, or the criminally careless one, did nothing; the denuded hillsides and mountainsides have remained largely as the ravaging lumberman left them; the waters have been permitted to pour unobstructed into the valleys and lay waste the towns, the villages, and the cities, and the damage done has been charged, probably, to profit and loss, or to "visitations of Providence." Scripture says, "The wages of sin is death." Carelessness, heedlessness, ignorance, is sin; and the wages of either of these is likewise death—death to the individual, or to the community, or to material well-being and prosperity.

* * *

Reforestation Good Business

FROM even the solely utilitarian, present-day view-point, a general policy of reforestation—together with a

rigidly adhered-to policy of forest conservation—is good, sound business. The reforestation of denuded slopes, mountainsides and watersheds is the only sure preventive of floods. Floods wash away, destroy, and lay waste, annually, property to the value of millions upon millions of dollars. If, therefore, even twenty-five per cent. of this waste can be prevented by reforestation, it would seem as if the "sound business sense" of a community would not hesitate a second to adopt such a policy. But there are other equally sound reasons for adopting such a policy—reasons sounder by far than those upon which rest the present industrial development of the country. Railroads require ties; mines have to be timbered; city building calls for lumber; farmers must have at least measurably fertile soil; and upon a prosperous, permanent and contented farming element rests the ultimate prosperity of any community or state. If the supply of railroad ties, let us say, in Pennsylvania, is approaching exhaustion, it becomes necessary for the roads to seek their ties farther away, and the same is true as regards the mines. The farther away the timber supply is, the more it must necessarily cost to secure it. Everybody who has built, in the past few years, knows how the price of lumber has increased. And, as regards the farmer and his "worn-out" farm, the reports of the immigration officers of the Canadian northwest make interesting reading. Hundreds and thousands of American farmers have, well within the last decade, moved across the border, leaving their "worn-out" farms for the virgin soils of Alberta, Manitoba, or British Columbia. Railroads and factories cannot easily follow the example of the farmers; but even factories may close down permanently, and railroads are no strangers to receiverships. With a permanently prosperous farming community a state will have prosperous factories and industrial concerns—the two go hand in hand; and with these, the railroads have plenty of business. Now, for the words "worn out," as applied to farms, write "washed away," and you have it. Farms, the top soil of which has all been carried into the rivers and down to the sea, cannot produce crops, and so the farmers are compelled to go elsewhere. And with the going of the farmers—the extinguishment of a permanently prosperous agricultural population—goes the basic principle of industrial or any other prosperity. Protect the forests and you protect the farms; protect the farms and you retain the farmers; retain the farmers and you maintain the prosperity of the community—it is as simple and as obvious as that two and two make four.

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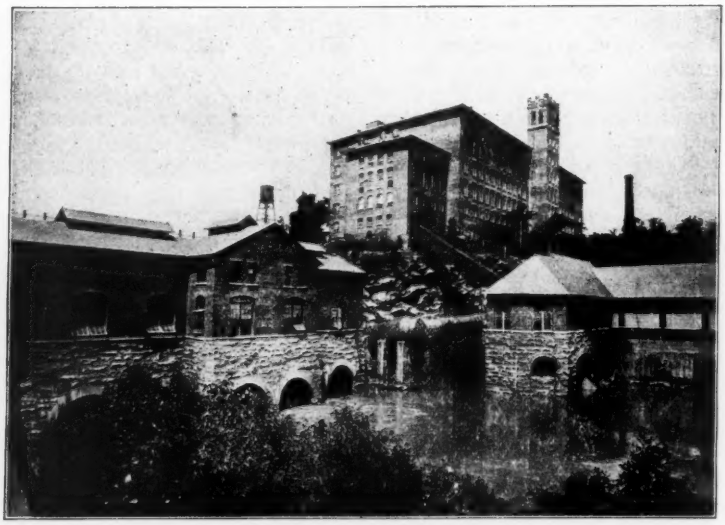
A Permanent Timber Supply

AND not alone from this side can it be unanswerably argued that it is sound business sense to preserve the forests and to reforest the stripped slopes and watersheds of the land. Take the following illustration: A young man starts in life with $10,000, invested so as to bring him six per cent. a year. Now, this young man cannot, or does not want to get along on $600 annually, so he uses his income and, yearly, trenches upon his principal to the amount of an additional $600. The second year he must draw still more heavily upon his capital; he cannot do with less than $1,200 per year. And so, at a steadily increasing rate, his capital is wiped out, until, in a few years, he has neither income nor capital. Your "practical business man" would call this young man a fool, and he would be right. But this very thing is what the sensible business men of the country have been doing for a long time. Let the $10,000 represent the original timber supply of, say, Pennsylvania; let the six per cent. represent the natural annual production, and let the $1,200 stand for the annual consumption of timber. Or apply the illustration to the country at large. Now, instead of making steady, year by year inroads on the forests, it would have been as easy to provide for a perma-



WATER-POWER UTILIZATION

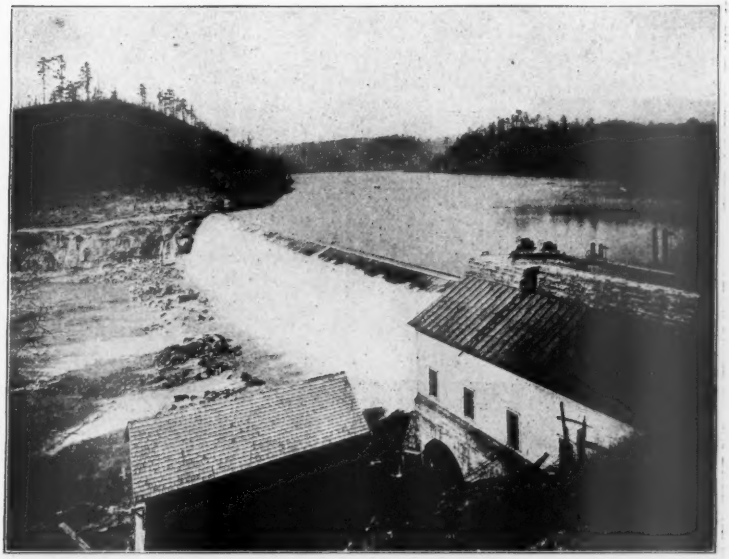
Plant of Columbus River Co., n Muscogee County, Georgia, on Chattahoochee River, which Heads in the Southern Appalachians

nent timber supply, by securing legislation that would prevent forest wastage, despoliation and the total stripping of timber from vast tracts. Instead of using the income—the natural reproduction—and a part of the capital—the original forest—each year, put the capital to work—take care of existing forests, and provide for new ones. If such a plan had been adopted in Pennsylvania fifty years ago, what would now have been the condition of the state? And what would, to-day, be the value of a permanent and adequate timber supply to the state? Mr. Practical Business Man, suppose you answer!

* * *

Water Transportation

NO THINKING man will deny that a comprehensive, well-developed system of water transportation would be wonderfully beneficial to the inland commerce of the United States. But to have a system of waterways, we must first have the water. There is plenty of water; but, under present conditions, it comes too much in bunches. At one season we have raging, swirling yellow torrents, while at another we have sand bars, shallows, and silt reefs. How can this condition be modified? Simplest matter in the world. Five words will explain: forest and flood water reservoirs. Let us reforest the denuded hillsides, mountain tops and watersheds, so that the storm waters, the melting snows, and the spring rains will not carry down with them, in their mad rush, the stones, gravel, sand, and silt, but will pass somewhat gradually down from the hills. Then let us dam the valleys at whose bottoms lie the feeders of the larger rivers; let us equip such dams with gates for regulating the flow of the water into the streams; let the reservoirs be of sufficient capacity to restrain any ordinary flood; and then let us so regulate the outflow of water from them as to maintain a navigable stage even in seasons of serious drought. We can then improve existing waterways, and plan and execute new ones, until the country is covered with a network of canals and streams made navigable by man; our



WATER-POWER ON A SOUTHERN RIVER

Typical Reservoir, Dunlap Dam of the North Georgia Power Co., on the Chattahoochee River at Gainesville, Ga.

railroads can be reserved for the transportation of perishable freights and passengers, our coal supplies can be conserved—and the freight rates on heavy merchandise can be materially lowered. If the application of this idea to the state of Pennsylvania alone, and to the Ohio River only from Pittsburg to Louisville, cost a hundred millions of dollars, it would still be well worth doing, and would still pay good returns on the investment.

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Water-power and Waterway Extension

IT IS also beyond doubt—a very easily demonstrable fact—that the sale of water-power created by reservoirs such as are spoken of here would be a source of large income to the state. It is, in fact, easily conceivable that the returns from such sales would provide funds for the maintainence of the entire system. It is not easy for the untechnical mind to grasp the immensity of this phase of the matter, or to conceive of the tremendous income—both in sale of power and in saving of coal consumption—that could readily be secured. Of course, long-distance transmission of electrical power is still a wasteful process; but with industrial concerns so thickly centered as they are in Pennsylvania—still using that state as an example—no serious obstacle would have to be overcome from that cause. It is no great matter to conduct electrical power two, or twenty, of fifty miles; it can be done commercially at a good profit. Much more so then, can it be done when the distance of transmission is only a very few miles, or nothing at all. If Pennsylvania will undertake the construction of a system of storm-water reservoirs and all-the-year-round waterways, and carry the plan through to completion and utilization, she will do these things: She will insure a permanent timber supply for the state; she will insure a permanently prosperous rural community and, therefore, the same sort of business community; she will put her coal supply in a position where it need never

THE DESTRUCTION OF FARMING LANDS

Alluvial Bottom, Ruined by Flooding. Soil Gone, Nothing Left but Gravel and Stones. Land Worthless
Swain County, North Carolina

again be worried about; she will prevent the annual loss by floods of millions of dollars of real property and hundreds of lives; and she will do it all at no actual cost to herself—the income from the investment will pay the upkeep and leave a handsome balance of profit. If the hard-headed business men of Pittsburg would turn their attention in this direction, instead of toward the formation of billion-dollar trusts and the upbringing of sons to make a laughing-stock of Pittsburg and America in general, or to fill Matteawan and similar places, it would be a better argument for their business sense.

* * *

Louisiana's Proposed Forest Law

FROM recent expressions in the Southern press it appears that an erroneous impression exists in regard to the proposed forest law now pending in the Louisiana legislature. Different newspapers and periodicals in the South have interpreted the provisions of the bill to mean that no timber whatever under twelve inches in diameter at four feet above the ground is to be cut under any conditions. If this was the intention of the bill, it would be well if it were defeated, as no such provision would be either just or practical. But this is not the intention of the measure, and the publications which have so construed it have fallen into error.

By the terms of the proposed statute the cutting of trees under twelve inches in diameter, four feet from the ground, is forbidden, it is true but only under certain conditions. The provisions of the bill do not apply to those who in good faith wish to clear the land for agricultural purposes, those who need the timber on the ground for roads, ditches, or construction purposes, or those who intend to use the wood for domestic purposes. Furthermore, lumbermen will be required to fell trees in such a way as to cause the least damage to young timber, and the refuse from lumber operations must not be

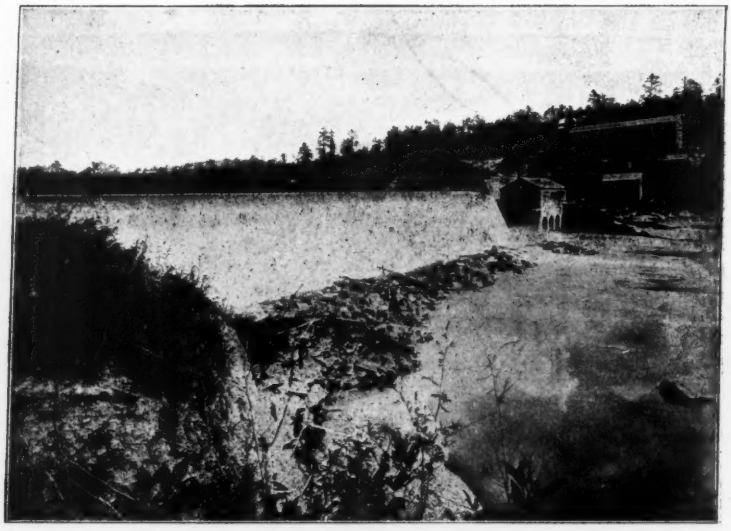
AN "ABANDONED" FARM

Deeply Eroded Gullies on a Slope Formerly Cultivated. Slowly Growing Up to White Pine

left where its presence will invite fires or in any other way endanger young trees. The law provides likewise for thinning timber stands so as to promote forest growth and prevent overcrowding and deadening, but such thinning is to be conducted under strict regulations and is not to be taken as an excuse for violating the spirit of the law. The penalty for violations of the proposed law is a fine of twenty-five to one hundred dollars for each offense, to which may be added imprisonment; and each tree cut in violation of the law is made to constitute a separate offense.

The proposed law not only defines and delimits offenses and names penalties, but also sets forth the reasons why the law is thought advisable. Timber is becoming scarce, it says, and ought not to be needlessly wasted. Forest destruction will carry with it other evils beside a dearth of wood. It will cause destruction, soil erosion, and increase floods and drought to the damage of the whole people. Furthermore, the forests should not be wholly cut down, because they assist in obstructing the progress of disastrous tornadoes.

A recent ruling of the Supreme Court of Maine declares that that state may lawfully restrict the clearing of privately owned forest land, if it is shown that the general public would be endangered by such clearing. While following the lines of the opinion rendered by the Maine Supreme Court, Louisiana's proposed law goes still further in the same direction. It is worthy of note that the two states which have been first to take so advanced a stand in the matter of forest protection are 1,500 miles apart, and their forests are not at all alike in character. They have different soils, climates with few points in common, crops of wholly different kinds, geography and topography of opposite extremes; yet to each of these states has come a full realization of the immense importance of the forests and how absolutely essential their protection is to the continued prosperity of the people.



WATER-POWER UTILIZATION

Dam and Power House of North Georgia Power Co., on the Chattahoochie River, Georgia

National Forests in the East

THERE is a perceptible drift of sentiment in the East at the present time in favor of the establishment of the Southern Appalachian and White Mountain National Forests at the earliest practical moment; and it appears probable that by the time Congress convenes in December this sentiment will have crystallized to such an extent as to make it possible to secure favorable action by both branches of the national legislature. Publications that in the past have been either opposed to the establishment of the two forests mentioned, or very lukewarm in support of the proposition, are almost daily becoming more favorable; while the trend in the case of individuals is still more pronounced. The educational work that has been done by the American Forestry Association, the new Appalachian National Forest Association, various commercial clubs, and similar organizations, and the large body of the press that has for years steadily supported the idea of national forests for the East, is bearing good fruit, and there is every reason to hope that at the coming Congressional session, crowded as it is sure to be with other work, there will still be found time for favorable action in this vitally important direction.

It would appear as if the developments of the present campaign have aided materially in bringing members of Congress to a realization of the public stand on this eastern forest question. All through the campaign voters in various parts of the East have been demonstrating in unmistakable fashion their approval of the proposal for the government to acquire, by purchase or otherwise, the tracts embraced within the boundaries of the two proposed forests; and not even the distractions of a national campaign have been sufficient to draw attention from this subject. Representatives and senators alike have come to a pretty full realization of the fact that the people generally in the regions affected desire above all things the establishment of the Southern Appalachian and White Mountain National Forests, and it is believed by many who are competent to judge from surface indications that the opposition to

GUARDING AGAINST EROSION

"Rip-rap" and Framework on Mississippi River. Protecting Bankf rom Washing and Caving Away

the establishment of the forests will be powerless to prevent favorable action at the next session.

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Business Men Should Take Part

IN ORDER to make doubly sure of such favorable action, however, it is necessary that business men and business organizations, such as commercial clubs, etc., should take a positive stand and voice their opinions in decided language. So far as we know, no commercial organization in the East has as yet opposed the establishment of these two national forests; but there has in many instances been a lack of positive approbation and decided utterance on the part of such organizations. If the business bodies and the business men of the sections affected will between now and November 3 take a determined and decided stand in favor of immediate enactment of measures that will provide for the establishment of the two forests, and will take the trouble to let their opinions be known and fully understood by their representatives, or by candidates who are to be voted for on November 3, it seems certain that the establishment of the forests will be provided for. It will not do, however, to relax effort; a continued program of educational work and uninterrupted demand for the enactment of such a law is vitally necessary, and this program should not be discontinued with the election. It should go right on, following the general election, until Congress convenes, and should be continued by able and tactful representation during the sessions of Congress and until the bills for such establishment have finally passed both houses.

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The Forest Holocaust

THE long season of rainless weather, the tinder-like condition of woods and fields, which affects prac-

WHY THE FARMS GROW POOR

Bed of Silt Washed Down from the Fields by Floods, and Deposited on River Bank, to be Removed by Dredging

tically the entire country, has brought its inevitable concomitant, a series of forest fires unparalleled in their destructiveness. Stretching across the continent from Minnesota to Maine, and reaching down the Atlantic seaboard as far as New Jersey; crowning the hills and peaks of the Adirondacks and the Catskills with smoke wreaths and coronets of flame; ravaging the little remaining pine timber of Wisconsin and Michigan, and searing the hills and valleys of Pennsylvania, the fires have swept on their way, until a record has been set for the summer of 1908 that for wide-spread destructiveness has, perhaps, never been exceeded.

Estimates by men high in authority in the Forest Service, and by equally distinguished authorities in other branches of the government—these estimates compiled from painstaking reports made by agents right on the spot—for the week of September 21 and the preceding week, placed the damage caused by these fires at $1,000,000 per day. A million a day going up in the smoke from our burning forests! If this amount of destruction was wrought by flames in any city in the land, the newspapers of the whole country would herald the fact under double-column headings! But in the case of the forest fires the newspapers print the story as a routine item of news; if the fires continue, as they have continued throughout this season, the news becomes more and more unimportant with each day, the items grow smaller and appear on inside pages, until finally the news is not considered worthy of publication at all. But the destruction continues; each day a million dollars worth of forests from our already rapidly diminished timber resources go up in smoke; and each day the whole nation—every man woman, and child in the United States—is further improverished!

In the two weeks ending September 22, half a score or more of towns and villages were totally destroyed by flames from the burning forests! Towns in Minnesota; towns in northern Michigan; towns in Wisconsin; towns in Maine; in the Adirondacks, and in

FIGHTING A FOREST FIRE

Running a Fire Line around a Dangerous Blaze on a Montana National Forest

Pennsylvania and New Jersey, have either been destroyed or so seriously threatened that the inhabitants fled for their lives.

These fires east of the Mississippi River have raged almost unchecked for weeks. Drought conditions existing over the entire country have helped the progress of the flames; while the unorganized, unsystematic, and somewhat aimless efforts to extinguish the fires have been well-nigh fruitless. The lack of precaution in preventing fires getting out; the inability to apprehend, and the disinclination to prosecute offenders against public safety, have helped to increase the destruction of the woods.

Conditions are different in the West, and particularly in the government forests. Fires have broken out during the past summer in national forests from the Canadian line to Arizona; from Colorado to California. In one of the western national forests the supervisor reported a short time ago that at one time fourteen fires were burning. Another supervisor reported twelve fires at one time in the forest under his charge. Fire fighting is a part of the business out there, however, and none of these fires attained any really serious proportions or did any great amount of damage. In most cases the fires were extinguished within twenty-four hours after they were discovered; while in no case reported were the fires burning longer than forty-eight hours after they started. Forest guards, rangers, and other national forest officers make the fighting of fires a part of their regular employment during the summer months. Fire patrols are constantly on the alert to discover blazes just starting, while conspicuous notices are posted all over national forests warning against the danger of fire and setting forth the Forest Service rules in the premises. Out there, when a fire starts it is speedily extinguished with the minimum of damage; east of the Mississippi River, where there are no national forests, the fires rage practically unchecked for weeks, destroying timber and other property at the rate of $1,000,000 per day! If there were no argument but this in favor of the speedy establishment of the Appalachian and White Mountain national forests, under Forest Service administration, it would seem to the casual observer that those forests should be established at once, and not only those forests but others in the Adirondacks,

the Catskills, the White Mountains, in Maine, in the forested mountain regions of Pennsylvannia, and every other eastern state.

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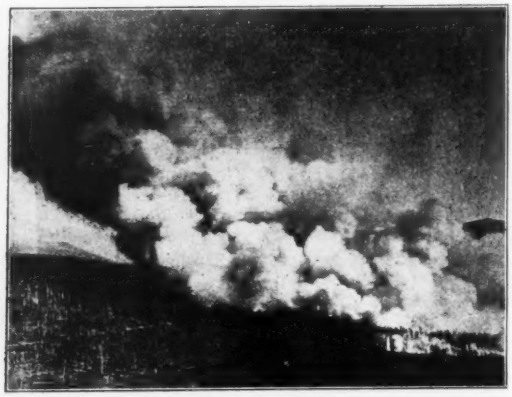
Obstructionists Retired

THE fact that several of the house and senate "undesirables" have been retired to private life during the past summer is surely indicative of an aroused and healthy public sentiment. Jenkins, of Wisconsin; Ankeny, of Washington; Long, of Kansas, and others have met with the down-turned thumbs in the political arena, and will be in a position to obstruct necessary and publicly-demanded reforms but a short time only. A reorganization of the House Judiciary Committee—that graveyard of legislation—is made necessary by the retirement of Representative Jenkins; and it is not at all unlikely that still other retirements will occur at the coming election. Voters all over the country have this summer demonstrated a marked ability to think, and with the coming of a thinking electorate the political extinguishment of men like those mentioned above is clearly in sight. Speaker Cannon himself is having the fight of his life in the Danville, Ill., district, and there is a good chance that the Speaker may be forced to remain at home at the close of his present term of office. Reports from Illinois indicate that the Speaker of the House has his back to the wall, and it is certain that he has this summer been forced into the hardest fight of his political career. It was hoped by campaign managers that Mr. Cannon would be able to give some of his time to the National Campaign Committee, and that he would be in a position to make speeches at many points in the East and Middle West; but the fight waged against him by the decent element of his district and the state of Illinois at large, that fight being led by the authorities of the Methodist Church, has kept the Speaker close at home, mending his own fences, instead of allowing him to lend his aid in the National campaign. Recent reports of Mr. Cannon's utterances in the conduct of his present campaign, quote him as resorting to his characteristic billingsgate and abusive profanity, and it is more than intimated that this course has alienated many voters who otherwise would have supported him. If the report is true, it is an unmistakable indication of the fact that Mr. Cannon realizes the seriousness of the fight in which he is engaged, and that he is, to use a slang expression, "on the run." It is to be hoped that those who are actively opposing him will keep him in that condition from now until the conclusion of the campaign. It would indeed be an augur of great things for the nation if Mr. Cannon's constituents were to keep him at Danville from now on.



Forest Fire in Colorado

COMMUNICATIONS

Varying Views

ILLUSTRATING the varying views entertained by individuals and corporations in regard to the question of forest conservation, etc., the accompanying letters recently received are interesting. They were written in reply to letters soliciting memberships in the American Forestry Association:

Little Rock, Ark.

Gentlemen: Yours asking me to contribute a certain amount of money for the preservation of the forests, etc., at hand. In response will say it seems to me that the large concerns that are depleting the forests and are receiving large revenues from the same should be the ones to meet this expense. In other words, millions of dollars have been made in this manner by wealthy concerns, and they are the ones who should be burdened with the taxation."

Respectfully yours,

——— ———.

Watertown, N. Y.

Gentlemen: I am in receipt of your circular letter. Our concern is very much interested in forestry and in forest reproduction, but in the face of all the agitation now going on and the very strenuous efforts being made by the American Publishers' Association to force through Congress the immediate removal of the tariff on paper and pulp without any investigation or hearing granted the paper manufacturers, we do not care to invest in forestry or anything else pertaining to paper manufacture.

Should the tariff on paper and pulp be removed we will be forced to cut off our own forests, without any regard to forest reproduction or anything else —cut off every stick that can possibly be used in making pulp and paper. After having exhausted our own forest, if we continue the manufacture of paper, we must move to Canada.

Until this tariff question is settled we do not care to consider anything in the way of forestry. If the tariff is removed we propose absolutely to denude every acre of forest we own.

Yours very truly,

——— ———.

In neither case does it seem advisable to use the name of the writer; but the expressions, we believe, will be interesting to our readers.

Unfortunately, there are too many concerns—as well as individuals—who hold the same opinions as those expressed in the second of these letters. On the other hand, there are similar concerns who take a different stand. Another big paper company takes the view that the best way in which to utilize forest properties is to cut timber according to forestry rules and regulations. In consequence, it is maintaining and will maintain a permanently valuable property, which will yield a steady income. This is in accordance with German experience. To our correspondents we would say, read the Forest Service Bulletin on "What Forestry Means;" also read another Forest Service publication, "Experience of the German Government." Both will prove enlightening.

Land Scheme

MR. PERCY P. VYLE writes from Gainesville, Fla.: "The question of wood is becoming a serious problem in the phosphate region. One of the phosphate companies has had the Forest Service examine a vast area of their cut-over land, which may be considered feasible for reforestation. Between the turpentine, lumber and phosphate industries, the forests of Florida are rapidly disappearing. When these industries get through with the

land, above and below, it will be truly deserted by God and man—even the buzzards will skim over the sun-baked, man-upheaved land for fairer hunting."

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Sweeping Winds

MR. JOHN A. STOUGHTON, of Hartford, Conn., writes us:

"Only this morning a man living near Hartford casually remarked about the changed conditions in his vicinity, owing to the cutting off of a belt of woodland near his home, allowing the winds to sweep in parching blasts over the fields, which had previously been protected. To me it appears wise to stimulate every landowner to cultivate forests, even in a small way; for the aggregate average in a few years would be immense and of incalculable value both from a climatic and pecuniary point of view."

FIRE FIGHTING ON A NATIONAL FOREST

Extending a Fire Line so as to Cut Off the Progress of the Flames. Systematic Work Makes It Possible to Handle Fires in an Expeditious Manner

NEWS AND NOTES

A Season of Droughts

FROM the Middle West, the West, and Northwest come reports of long-continued and damaging droughts —a peculiar condition, it would seem, to those who only a few weeks ago read of the destructive floods that raged in the south and southeastern parts of the country. In the early part of September the drought conditions in western Pennsylvania and West Virginia became so serious as to interfere with industrial activity. Several plants of the Frick Coke Company were compelled to shut down, owing to shortage of the water supply; while at Morgantown, W. Va., the big plant of the American Sheet and Tinplate Company was forced to suspend operations for the same cause. Scores of lumber, coal and coking plants in the two states mentioned were also compelled to close down for longer or shorter periods because of lack of water; while Johnstown, Pa., has been practically without water for some weeks, owing to the total drying-up of two of the large reservoirs supplying the town.

In the Middle West the drought conditions have been equally severe and long-continued. In the section surrounding Laporte, Ind., and contiguous territory, on September 13, the farmers joined in all-day services, praying for rain. Through Indiana Ohio, Michigan, Wisconsin, Iowa, and on west to the Rocky Mountains, the drought also prevailed, doing great damage and paving the way for destructive fires, insect plagues, and a host of evils. Reports for the irrigated lands of the West indicate that not in a great many years has there been such a pronounced shortage of water for irrigation purposes; while, in the middle western regions, farmers hauled water in barrels, for distances of several miles, to supply their live stock.

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Flood Damage in the South

NOT in years has the South been visited with as serious and disastrous floods as those that swept the streets of Augusta, Ga., and other Southern cities a few weeks ago. Damage to the amount of several millions of dollars was done by floods in Georgia alone; while neighboring states suffered almost equally appalling loss. While the West and the Middle West suffered from drought and forest fires, the South was being plagued with inundations that swept away property to the value of millions, and caused the loss of scores of human lives. The same conditions are responsible for the floods in the South and the drought in western Pennsylvania and West Virginia, namely, the deforestation of the mountain slopes. Pennsylvania's annual flood loss runs into the millions of dollars, and the South is rapidly coming to a similar condition. Spring and winter floods annually ravage Pennsylvania, sweeping away in a few days property amounting in value to far more than would be the cost of inaugurating and maintaining a thorough and practical system of mountain-slope reforestation and water conservation by means of flood-water reservoirs; while the establishment of a comprehensive system of such reservoirs would do away with conditions such as have lately forced the suspension of scores of mills and factories that have been compelled to close down on account of lack of water. Floods at one season—inundations that ravage an entire region and wash away millions of dollars in property and other mil-

lions of dollars in soil and humus—and scorching droughts at other seasons; this is the invariable history of a country from which the forests have been stripped.

National Conservation League

WITH Walter L. Fisher, of Chicago, as president, President Roosevelt as honorary president, and William Jennings Bryan, and William H. Taft as honorary vice-presidents, the National Conservation League has been organized. The National Rivers and Harbors Congress has taken the initiative in the movement for welding into a coherent whole the various conservation organizations of the country, and the membership of the newly-formed league will eventually embrace all such bodies, those of a local scope as well as those whose field of activity is the whole nation. The league idea has been under more or less serious consideration for a long time, but the impetus that has at last resulted in its formation was given by the White House conference last May. The purpose of the league are given in its declaration of principles, which follows:

"Whereas it is of the utmost importance that the natural resources of the nation shall be comprehensively and vigorously developed and utilized for the promotion of the public welfare without waste, destruction or needless impairment, and subject always to their intelligent conservation and the effective preservation of the rights and interests of the future generations of our people.

"Now, therefore, to secure the recognition and support of these principles by the people and by their representatives, we hereby unite in a national conservation league, and adopt for ourselves the following, taken directly from the declaration unanimously adopted by the Conference of Governors convened by the President of the United States in the White House at Washington, May 13, 14, and 15, 1908.

"We do hereby declare the conviction that the great prosperity of our country rests upon the abundant resources of the land chosen by our forefathers for their homes and where they laid the foundation of this great nation.

"We look upon these resources as a heritage to be made use of in establishing and promoting the comfort, prosperity, and happiness of the American people, but not to be wasted, deteriorated, or needlessly destroyed.

"We agree that our country's future is involved in this: That the great natural resources supply the material basis upon which our civilization must continue to depend, and upon which the perpetuity of the nation itself rests.

"We agree that this material basis is threatened with exhaustion.

"We agree that the land should be so used that erosion and soil-wash shall cease, and that there should be reclamation of arid and semi-arid regions by means of irrigation and of swamp and overflowed regions by means of drainage; that the waters should be so conserved and used to promote navigation, to enable the arid regions to be reclaimed by irrigation and to develop power in the interests of the people; that the forests which regulate our rivers, support our industries ,and promote the fertility and productiveness of the soil should be preserved and perpetuated; that the minerals found so abundantly beneath the surface should be so used as to prolong their utility; that the beauty, healthfulness, and habitability of our country should be preserved and increased; that sources of national wealth exist for the benefit of the people, and that monopoly thereof should not be tolerated.

"We declare our firm conviction that this conservation of our national resources is a subject of transcendent importance which should engage unremittingly the attention of the nation, the states and the people in earnest cooperation.

"We agree that this cooperation should find expression in suitable action by the Congress and by the legislatures of the several states.

"Let us conserve the foundations of our prosperity."

For Automobilists' Information

IN THE September issue of this magazine occurred a mention of the fact that automobilists are beginning to find the topographic maps issued by the United States Geological Survey of great help in laying out tours or lines of travel. For the information of many correspondents who have written the editor asking for information regarding these topographic maps, it may be

AN "ABANDONED" FARM

Hillside Erosion and Gullies, Where the Top Soil Has Been Washed Away. No Soil, No Farm
Catawba County, North Carolina

said that letters addressed to the Geological Survey, Washington, D. C., asking for information, will receive prompt answers. The Survey will advise all inquirers in regard to maps already issued, as well as those shortly to be published, and will give all details as to how the maps may be of help to tourists, just what regions they cover, how to secure them, etc.

* * *

Interested in Conservation

THE West Virginia Board of Trade announces that its fourth annual meeting will be held in Clarksburg, W. Va., on November 10 and 11, next. It is also announced that at this meeting forestry, and the general subject of conservation of natural resources will receive much attention, and that the board intends to forward the cause of the forests and other natural resources in every way possible. At the last meeting, held in Elkins, W. Va., Mr. William L. Hall, associate forester of the Forest Service, delivered a comprehensive and interesting address on "The Appalachian National Forest. At that time the board adopted resolutions providing that a committee be appointed which should prepare and submit to the governor of West Virginia, for his consideration and for action by the state legislature, a bill or bills outlining a state forest policy and providing for state forest reserves and forest protection. The resolutions also favored the establishment of the proposed Appalachian National Forest, and urged the senators and representatives from West Virginia to vote for the speedy establishment of the proposed forest.

* * *

Tan-bark Supply Failing

FIGURES lately compiled by the Census Bureau, with the assistance of the Forest Service, would seem to indicate that the American supply of tan bark is decreasing. A loss in val-

ue in the 1907 consumption of tan bark of $281,846, is noted, as compared with 1906; while the total production of bark fell off 156,941 cords, or 11.4 per cent. decrease from 1906. A decrease in value and an increase in cost, delivered to the tanneries, etc., is also noted, while the use of extracts and chemicals in tanning is noted, 35 510,130 pounds more of such extracts and chemicals being used in 1907 than in 1906. A summary of the Census Bureau's advance outline follows:

In point of value, the reported consumption of these commodities in the tanneries of the United States in 1907 was slightly less than the reported consumption in 1906, the decrease being from $21,487,393 to $21,205,547, a loss of $281,846, or 1.3 per cent. The total quantity of tan bark consumed decreased from 1,371,342 cords to 1,214,401 cords, a loss of 156,941 cords, or 11.4 per cent. The value of tan bark decreased from $12,774,071 to $11,555,874, a loss of $1,218,197, or 9.5 per cent., while the average cost per cord delivered at the tannery advanced between the two years from $9.32 to $9.52, a gain of $0.20, or 2.1 per cent. The total consumption of extracts was substantially larger in 1907 than in the preceding year, the increase being from 329,389,405 pounds to 364,899,535 pounds, a gain of 35,510,130 pounds, or 9.7 per cent. In total value this material advanced from $8,713,322 to $9,649,673, a gain of $936,351, or 9.7 per cent.

The two general movements in the tanning industry which have characterized its development during recent years are clearly disclosed by the figures. The growing scarcity of barks and native extracts and, in a measure as a result of this, the increasing use of chemicals as tanning materials, is evident from the fact that the total outlay for barks and native extracts was smaller in 1907 than in 1906, although as a rule the average cost per unit of these commodities increased. That the supplanting of barks by extracts continues at a rapid rate, and that this is incidentally effecting a change in the industry with respect to its location and the size of the average plant is apparent. The greater ease and economy with which extracts can be transported as compared with the handling of barks is resulting in a tendency to locate the tannery more with regard to an advantageous marketing of products and less with regard to the source of materials. A number of small plants reporting in 1906, and using bark exclusively, have either closed down permanently or removed from the more remote districts where supplies of bark were available to more advantageous shipping points, and substituted extracts or chemicals for barks as the principal tanning materials. This trend of the industry is indicated in the decreased number of establishments reporting in the later year, the statistics for that period covering 583 plants, while those for 1906 covered 627 active tanneries. Of the total number of plants reporting in the later year, 121 used tan bark exclusively, 122 extracts exclusively, and the remaining 340 both barks and extracts, as tanning materials. As in the preceding year, hemlock bark was used more extensively than any other, the consumption in 1907 amounting to 815,840 cords, and constituting sixty-seven per cent. of the total of all barks. Oak bark ranked next to hemlock, with 349,594 cords, while chestnut and other kinds were consumed in minor and relatively unimportant quantities.

The leading extract in both years in point of consumption was quebracho, and according to the reports the consumption of this material increased from 133,508,306 pounds in 1906 to 145,324,677 pounds in 1907, a gain of 11,816,371 pounds, or 8.84 per cent. Chestnut extract ranked second in both years and increased from 128,535,018 pounds to 134,819,100 pounds, a gain of 6,284,082 pounds, or 4.7 per cent. These two extracts combined formed 79.6 per cent. of the total of this class of materials in 1906, and 76.8 per cent. in 1907, while quebracho extract alone formed substantially the same percentage of the total in both years, namely, 39.8 per cent. in 1907 and 40.5 per cent. in 1906. A slight decrease is noted in the average cost per pound of quebracho extract in 1907, while a small advance was made in that of chestnut extract. The consumption of hemlock extract increased from 34,405,978 pounds to 40,133,524 pounds, a gain of 5,727,546 pounds, or 14.3 per cent., with little change in the average cost per pound. The quantity of oak extract consumed was practically the same in the two years, being 30,192,151 pounds in 1906 and 30,830,291 pounds in 1907, while the average cost per pound advanced slightly, the increase being from $0.02 to $0.021.

* * *

Information Desired

UNDER date of August 27 the United States Forest Service sent out the following letter, requesting detailed information along certain lines, the Service having been requested to undertake the investigation by the National Conservation Commission recently appointed by President Roosevelt. The letter in full is printed herewith, and members of The American Forestry Association, as well as all other readers of CONSERVATION, are re-

quested to communicate to the Forest Service any facts in their possession which may throw any additional light on the various phases of the question of relation of forest covers to water supply. The letter follows:

United States Department of Agriculture, Forest Service, Washington, Office of the Forester,

August 27, 1908.

The National Conservation Commission appointed by the President as a result of the conference of the governors held last May, has asked the Forest Service to furnish information regarding our forest resources and their relation to other natural resources. One of the most important subjects in this connection is the relation of forests to the water supply in all its phases—irrigation, water power, navigation, and the supply for towns and cities. The Forest Service is planning to take up a detailed study of this problem in cooperation with the Weather Bureau, the Reclamation Service, and the Geological Survey. In order, however, to secure immediate information for the commission and to supplement the field work of the Forest Service, which will necessarily be confined to somewhat limited areas, the following questions are being asked of competent observers throughout the United States who are known to be interested in the problems which concern our national welfare:

1. Have any instances come under your notice where the removal of the forest cover from a certain watershed has had any definite effect upon the flow of the streams which take their rise there, and if so to what extent? Please give the dates, as nearly as possible, the exact location of the watershed, and describe, as nearly as you can, the topography, the rock, the soil, and the kind of forest removed.

2. Have you observed any relation between the condition of watersheds and the silting up of rivers, ponds, and reservoirs?

3. Do you know of any specific instances where the destruction of the forest cover upon watersheds which furnish water for the use of towns or cities can be held responsible for the breaking out of epidemics?

4. Do you know of any specific cases where springs have dried up after destruction of the forest cover, or where they have returned with its restoration? Please give the dates, as nearly as possible, the exact location of the spring, and describe the topography, the rock, the soil, and the character of the forest which was removed or which has sprung up again.

5. Do you know of any instances where artesian wells have dried up, or where they have begun to flow again? Can any connection be traced between this and the condition of the catchment basin? Give the dates as nearly as possible, the location of the catchment basin, and describe the topography, rock, soil and the general forest conditions.

6. Can you suggest the names of any persons who would be in a position to give additional facts?

Any information which you can give along these lines will be greatly appreciated by both the Conservation Commission and the Forest Service. As early a reply as possible is desired in order that the material may be used by the commission in its report November 1. I enclose a franked envelope for reply.

Very truly yours,

W. F. Cox,
Assistant Forester.

* * *

Production of Pig Iron in the United States

THE pig-iron production of the United States in 1907 amounted to 25,781,361 long tons, as compared with an output of 25,307,191 tons in 1906, and of 22,992,380 long tons in 1905, according to a statistical report just published by the United States Geological Survey. The smallness of the increase shown in 1907 over 1906 is due to the falling off in demand and production during the last quarter of the year. If the rate of output of the first half of

the year had been maintained the total production of pig iron in 1907 would have been 27,000,000 tons.

Statistics of the production of pig iron have not hitherto been collected independently by the United States Geological Survey, the figures published in its annual reports on mineral resources having been furnished by Mr. James M. Swank, the general manager of the American Iron and Steel Association. In January, 1908, however, in order to ascertain the value of the pig-iron output, circular letters were sent to all the producers asking them to furnish to the Survey confidential information as to stocks on hand December 31, 1906, marketed production, total receipts from sales free on board at furnace during 1907, and stocks on hand December 31, 1907. The managers of only three furnaces, rated at an average annual output of 35,000 tons each, refused or failed to comply with this request, and the total production reported to the Survey differs by only about four-tenths of one per cent. from the total output reported by Mr. Swank—25,781,361 long tons.

The following table gives the quantity and value of pig iron produced in the United States in 1907, by states:

Quantity and value of pig iron produced in the United States in 1907 *by states*

State	Quantity (Long tons)	Value
Alabama	1,686,674	$30,100,000
Illinois	2,547,768	52,229,000
New Jersey	373,189	7,554,000
New York	1,659,752	33,097,000
Ohio	5,250,687	106,387,000
Pennsylvania	11,348,549	234,952,000
Tennessee	393,106	7,542,000
Virginia	478,771	8,963,000
Colorado	468,486	11,628,000
Missouri		
Connecticut	19,119	663,000
Massachusetts		
Georgia	55,825	1,181,000
Texas		
Indiana		
Michigan	758,590	18,829,000
Minnesota		
Wisconsin		
Kentucky		
Maryland	830,845	16,833,000
West Virginia		
	25,781,361	529,958,000

Harry Day Everett

AT THE Forester's Conference, held in the office of the Bureau of Forestry of the Philippine Islands on July 29, the following resolutions in memory of Harry Day Everett, the young Forester who was murdered by natives of the island of Negros, on May 11 last, were adopted:

By the death of Harry Day Everett, Forester, and Chief of the Division of Forest Administration, the Philippine Bureau of Forestry loses one of its most efficient and faithful workers.

Mr. Everett first became interested in the subject of forestry during the latter years of his academic course at Cornell University. After his graduation in 1903 as Bachelor of Arts, he entered the University of Michigan, from which institution he received the degree of Master of Science of Forestry in 1904. From 1902 to 1904 he spent his summer vacations with field parties of the United States Bureau of Forestry, and upon completion of his studies at Michigan entered the service as a forest assistant.

In 1905 Mr. Everett transferred from the Forest Service of the United States to the Bureau of Forestry, Philippine Islands. Soon after his arrival in the Philippines he was placed in charge of forest district No. 8, embracing the Visayan Islands. On the reorganization of the bureau in 1907 he was made chief of the division of forest administration. During the absence of the director of forestry in the United States, from August, 1907, to April, 1908, Mr. Everett was placed in charge of the affairs of the bureau. The duties of acting director he relinquished on the return of the director. Shortly afterwards he left for Iloilo to prepare for the expedition on which he was killed. He had for some time desired to finish his work in Southern Negros, which, when done, would complete his forest studies and forest map for the Island of Negros. Together with work previously accomplished in Negros, the results of this expedition were intended

for a bulletin on the forest conditions of that island.

According to the best information available, Mr. Everett had already made one journey across Negros from Cabancalan on the west coast to Bais on the southeast coast, and had started to return to Cabancalan by the way of Tolon on the southern coast. About three or four days inland from this town, at the sitio of Pamari, on May 11, the guide, assisted by his followers, drugged Mr. Everett and party, while asleep, by means of fumes of a narcotic plant, and then murdered them. Therefore be it

Resolved, That the Director of Forestry, and members of the Bureau of Forestry assembled in conference on this 27th day of July, 1908, express our appreciation of the services, efficiency, and character of Mr. Everett, whose personality and accomplishments will leave their mark on the future personnel and work of this bureau; and be it

Resolved, That this conference extend to his family in their hour of affliction, our deep sympathy for their loss, a loss which we as his associates, who knew him both personally and professionally so thoroughly feel; and be it

Resolved, That a copy of this testimonial be sent to the bereaved family, the *Manila Times* and *Cablenews-American*, CONSERVATION, Washington, D. C., *Forestry Quarterly*, Ithaca, N. Y., and the Alumni Associations of the University of Michigan, and Cornell University, and Gifford Pinchot Forester, United States Department of Agriculture, Washington, D. C.

* * *

The New Mexico Coke Industry

NEW Mexico is assuming considerable importance as a coke producer, according to E. W. Parker, chief statistician of the United States Geological Survey, notable progress having been made during the last three years.

In 1903 there were but two coke-making establishments in the Territory, with a total of 126 ovens, and the production amounted to 11,050 tons. In 1904 the number of establishments was increased to three, the number of ovens to 234, and the output to 58,259 tons. In 1905 the same number of establishments reported 258 ovens completed and 489 building, and the production amounted to 89,638 tons. In 1906 four establishments with a total of 571 completed ovens and 450 building, produced 147,747 tons of coke. Of the ovens building in 1906, 325 were completed in 1907, increasing the total number of completed ovens to 896, and the production of coke increased to 265,125 tons.

The increase in 1907 advanced the territory from sixteenth to fifteenth place in the rank of the coke-producing states and territories, and gave New Mexico a larger percentage of increase than any other state or territory except Kansas. In Kansas, however, the production of either year was insignificant. The increase of New Mexico's coke production in 1907 over 1906 was 117,378 tons, or 79.45 per cent., in quantity, and $397,541, or 89.8 per cent. in value. The average price per ton increased from $3 in 1906 to $3.17 in 1907. One of the establishments, having a bank of fifty ovens, was idle during the year.

Of the 446,140 tons of coal converted into coke in the territory in 1907, all except 2,498 tons was washed slack.

Mr. Parker's statistical report on the coke industry has just been published by the Survey as an advance chapter from "Mineral Resources of the United States, Calendar Year 1907." Copies of this report may be obtained by addressing the Director of the Geological Survey at Washington, D. C.

* * *

Oil Field Investigations in 1907 and 1908

WORK in the various oil fields of the country by members of the United States Geological Survey was carried forward much more actively during 1907 than in any previous year. In California Ralph Arnold and Robert Anderson extended the general investi-

gations which they have had in progress to the Coalinga field; in Wyoming C. W. Washburne and Deane Winchester investigated the occurrence of oil and natural gas in the Bighorn field; in Colorado the geology of the Rangely oil field was studied by Hoyt S. Gale; in Utah the occurrence of oil at Virgin City was investigated by G. B. Richardson; and in Pennsylvania, where cooperative work was carried on with the State Survey, M. J. Munn studied the oil fields of the Clarion, Carnegie, and Sewickley quadrangles, and Charles Butts those of the Warren quadrangle.

As a result, in part, of the field work of recent years the United States Geological Survey has published the following bulletins bearing on the oil areas of the country:

238. Economic geology of the Iola quadrangle, Kansas, by G. I. Adams, Erasmus Haworth, and W. R. Crane. 1904.
250. The petroleum fields of the Pacific coast of Alaska, with an account of the Bering River coal deposits, by G. C. Martin. 1905.
256. Mineral resources of the Elders Ridge quadrangle, Pennsylvania, by R. W. Stone. 1905.
265. Geology of the Boulder district, Colorado, by N. M. Fenneman. 1905.
279. Mineral resources of the Kittanning and Rural Valley quadrangles, Pennsylvania, by Charles Butts. 1906.
282. Oil fields of the Texas-Louisiana Gulf Coastal Plain, by N. M. Fenneman. 1906.
286. Economic geology of the Beaver quadrangle, Pennsylvania, by L. H. Woolsey. 1906.
296. Economic geology of the Independence quadrangle, Kansas, by F. C. Schrader and Erasmus Haworth. 1907.
300. Economic geology of the Amity quadrangle, in eastern Washington County, Pa., by F. G. Clapp. 1907.
304. Oil and gas fields of Greene County, Pa., by R. W. Stone and F. G. Clapp. 1907.
309. The Santa Clara Valley, Puente Hills, and Los Angeles oil districts, southern California, by G. H. Eldridge and Ralph Arnold. 1907.
317. Preliminary report on the Santa Maria oil district, Santa Barbara County, Cal., by Ralph Arnold and Robert Anderson. 1907. (Out of stock.)
318. Geology of oil and gas fields in Steubenville, Burgettstown, and Claysville quadrangles, Ohio, West Virginia, and Pennsylvania, by W. T. Griswold and M. J. Munn. 1907.
321. Geology and oil resources of the Summerland district, Santa Barbara County, Cal., by Ralph Arnold. 1907. (Out of stock.)
322. Geology and oil resources of the Santa Maria oil district, Santa Barbara County, Cal., by Ralph Arnold and Robert Anderson. 1907.
340—F. Investigations relating to petroleum and natural gas in 1907, by Ralph Arnold, G. B. Richardson, C. W. Washburne, and A. R. Schultz. 1908.
350. Geology of the Rangely oil district, Colorado, by H. S. Gale. 1908.
357. Geology and oil resources of the Coalinga oil district, Fresno and Kings counties, Cal., by Ralph Arnold and Robert Anderson. (Preliminary report.)

Preliminary announcement of the results obtained in the field examinations of 1907 have been published as Section F of Bulletin 340, which contains the following chapters: Miner ranch oil field, Contra Costa County, Cal., by Ralph Arnold; Petroleum in southern Utah, by G. B. Richardson; Labarge oil field, central Uinta County, Wyo., by A. R. Schultz.

The following investigations will be carried on during the field season of 1908:

Continuation of work in California oil fields, by Ralph Arnold.

Comprehensive studies of the Mid-Continent field, by J. A. Taff and W. J. Reed.

Occurrence of oil in the Foxburg quadrangle, Pennsylvania, by G. H. Ashley and M. J. Munn.

Preliminary examination of the oil pools at Belle Isle and of the Caddo field, Louisiana.

Occurrence of oil in the vicinity of Florence Colo., by C. W. Washburne, and in the Boulder field, Colorado, by G. C. Martin.

* * *

Interest of Women in Conservation

THE following communication from Mrs. Frances Shuttleworth, corresponding secretary of the Women's National Rivers and Harbors Congress, is another indication of the intense interest that is taken by women generally, and clubwomen in particular, in the conservation movement:

EDITOR CONSERVATION:

I am writing to congratulate you on the splendid magazine you are now publishing in the interests of our natural resources. Particularly am I interested in all articles that touch on waterways and forests. As you may know, the Women's National Rivers and Harbors Congress was organized in Shreveport, La., on June 29 last, to promote as one problem the development of all practicable waterways and the extension and conservation of forests. This Congress aims to cover the nation with a net work of information that will in time bring men and women to a full realization of our country's possibilities

IN KERN RIVER CANYON

Where Power Projects Are Under Way that Are Expected to Develop Electrical Energy to the Amount of at Least 50,000 Volts as a Beginning

for permanent prosperity with such development and extension, and to demonstrate unmistakable the rapid and sure decadence of the country unless the national government takes the conservation of these resources in hand, and, with expert care and supervision and liberal appropriations, looks vigorously to their pressing needs. We believe that, with this sort of conservation of waterways and forests by the national government, with the states and individuals giving earnest cooperation as they realize that it is the government's right and duty to preserve our material prosperity, the result will largely cover the conservation of all other resources.

What I want to ask you is this: As we are so nearly allied in purpose—in part wholly so—would you care to aid our propaganda and yours by printing some of the notes of our progress? We should be glad to send the material to you; our organization must be your organization's half-sister. Awaiting your reply, while we again assure you of our heartiest endorsement and appreciation of CONSERVATION, I am,

Cordially,

(MRS.) FRANCES SHUTTLEWORTH,
Cor. Sec. Women's National Rivers and Harbors Congress.
Shreveport, La.

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Leading Nations Import Much Lumber

FEW people have the slightest conception just how important a part timber and unmanufactured wood play in the trade between the world's great nations, and doubtless it is news to many to learn that the lumber importations of the various countries amounts to $285,600,000. This is according to estimates for the whole world, compiled by Dr. Ernest Friedrich, of the German Commercial High School at Leipzig.

Notwithstanding the fact that it finds its own supply dwindling, the United States furnishes about twenty per cent.

of the lumber imported by other countries. Austria-Hungary furnishes nineteen per cent., Russia sixteen per cent., Canada thirteen per cent., Sweden eighteen per cent., Finland ten per cent., and Norway and Roumania a small quantity.

The countries importing wood are those on the highest economical plane, which were themselves in earlier times densely wooded, but whose forests have been denuded to a greater or less extent to make room for agriculture and other industries, says Vice-Consul James L. A. Burrell, of Madgeburg, in a report to this government. Only four per cent. of the territory of Great Britain is covered with forests, and during the year 1906 that country imported lumber to the value of $135,561,750. Germany has still twenty-six per cent. of its territory covered by forests but imported in 1906 lumber valued at $61,285,000. Belgium and the Netherlands, that have but eight per cent. forest lands, Denmark, that has seven per cent., France and Switzerland, with a small percentage, are all compelled to import lumber.

Besides these countries, those lands lying on the dry western side of the sub-tropical zone lacking forests are forced to import wood. Egypt imports wood and coal to the value of about $16,660,000 annually; Algeria Tunis, Spain, Portugal (with only three per cent. forest land), Italy, Greece (with nine per cent. forest land), the eastern part of Asia, British South Africa, the western part of Chile and Peru, the Argentine Republic, and Australia, all poor in wood, are dependent upon import.

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The Waters of the Great Lakes

MORE than four million people, living in a hundred cities, obtain water for domestic and industrial uses from the great inland seas on the northern boundary of the United States; and boiler water for the enormous land and water traffic that joins these cities to one another and to the rest of the world is derived from the same source. The chemical composition of these waters is therefore a matter of great interest to both sanitarians and chemical engineers, and a study of that composition is also valuable because the comparative equable condition of the lake waters allows them to serve as a standard for comparison with other waters in the northern region.

About two years ago the United States Geological Survey began a study of the waters of the Great Lakes in connection with a rather extensive investigation of the economic value of surface waters in the United States. For a year a 1-gallon sample was collected each month from each lake at a point where the water would probably represent the normal quality of the discharge. Samples of Lake Superior water were taken from St. Mary's River just above the locks at Saulte Ste. Marie, Mich.; the Lake Michigan samples were collected from a ferryboat in the Straits of Mackinac; St. Clair River was sampled in midstream at Port Huron, Mich; Lake Erie was sampled at the Buffalo (N. Y.) waterworks intake; and St. Lawrence River was sampled at Ogdensburg, N. Y., since no important streams enter between that city and Lake Ontario. The waters were shipped in special containers to the water-testing laboratory of the Survey at Washington, D. C., and were analyzed from one to three months after date of collection. Suspended matter was removed before the samples were evaporated, and standard methods of water analysis were followed when practicable.

Mr. R. B. Dole, under whose direction the analyses were made, states that the most noticeable feature in a cursory examination of the analytical data is the slight variation in the concentration of the waters from month to month, the total variation, as shown by the dissolved solids figures, being only eighteen parts per million, or fifteen per cent. As rivers of ordinary size may vary 200 to 300 per cent., and even large rivers, like the Mississippi, may

change fifty per cent. in their mineral content during the year, this annual fluctuation of fifteen per cent. is very small. The average monthly fluctuation in the discharge of the Great Lakes is considerably more than fifteen per cent., ranging from forty per cent. in St. Mary's River to twenty-seven per cent. in St. Lawrence River at the foot of Lake Ontario. The chemical composition of the water does not, therefore, bear a fixed relation to the quantity of water discharged. Mr. Dole gives as the probable reasons for this comparative steadiness in concentration the absence of large tributaries and the low ratio between the areas of the drainage basins and the lake surfaces.

Though the lake waters do not change greatly from month to month, they differ a great deal from one another in concentration. Lake Superior is least strongly mineralized; Lake Michigan is twice as high in total solids, and Lake Huron is but little less mineralized than Lake Michigan. Lakes Erie and Ontario are practically alike in mineral content, holding about two and one-half times as much solids in solution as Lake Superior. Reason for the striking difference in the lake waters is found in the character of the geologic formations in the drainage basins tributary to them. The crystalline and igneous rocks—granite, schist, gneiss, and basalt—that predominate all around Lake Superior, are not easily soluble, and hence the lake receives few affluents bearing large quantities of dissolved matter; Lake Michigan and Lake Huron, on the other hand, receive drainage from limestones and sandstones of the sedimentary series and contain much greater proportions of mineral matter. Dilution by the softer water of Lake Superior probably accounts for the fact that Lake Huron water is less mineralized than that of Lake Michigan. It is probable that forestation, sedimentation, and relation of rainfall to run-off also affect the relative composition of the lake waters.

Comparison of the analyses of the lake waters with those of tributaries to the system shows, according to Mr. Dole, that the lakes are almost invariably softer than their affluents. The reason for this difference is apparent: As the lake surfaces are large in proportion to their corresponding land drainages a great part of the rain falls directly into the lake waters and dilutes them; on the other hand, rain falling upon the land becomes more or less impregnated with mineral salts before it reaches the lakes in the normal run-off. This fact has an important relation to the industrial consumption of the waters, and shows the importance of locating intakes outside of the influence of tributary streams.

A study of all the data at hand leads to the conclusion that the lake waters may be specially recommended for industrial and domestic uses wherever they can be economically obtained. They are low in mineral content and normally free from turbidity, and the nature of the dissolved constituents is such that they can be used for boilers and for most other industrial purposes without purification.

NAVIGATION RESOURCES OF AMERICAN WATERWAYS.

By EMORY R. JOHNSON, Ph.D.

Professor of Transportation and Commerce, University of Pennsylvania, Philadelphia

THE primary purpose of this paper is to describe the water transportation system within the United States, to state what has been spent upon improving our waterways, to give the facts regarding the present use of our lakes, canals, and rivers, to point out and account for the progress of the coastwise and Great Lakes commerce, and to explain the decline of the traffic upon canals and upon most of our rivers. In order to add to the significance of the data regarding the United States, the mileage and traffic of the inland waterways of England, France, and Germany are given. The discussion closes with a summary of the facts and conditions that indicate a larger use of American waterways in the future.

The inland waterways of the United States comprises about 25,000 miles of navigated rivers, a nearly equal mileage of streams that can be made navigable by the improvement of their channels and the regulation of the flow of their waters, the five Great Lakes with a combined length of 1,410 miles, and 2,120 miles of operated canals. In addition to these rivers, lakes, and canals there are 2,500 miles of sounds, bays, and bayous, capable of being converted by means of connecting canals aggregating less than 1,000 miles in length, into a continuous and safe inner route for the coastwise traffic of the Atlantic and Gulf. The waterways in our country—rivers, canals, lakes, and coastal channels—have an aggregate length of between 55,000 and 60,000 miles, and only about half of the entire mileage is now used for navigation.

Considering the great length and undoubted value of our inland waterways, comparatively little has been done to make them commercially useful. The most effective work has been done in improving the harbors and channels of Lakes Superior, Michigan, Huron, and Erie, where natural depths of eight and twelve feet have been increased to twenty-one, with the result that the freight now shipped on the Great Lakes —75,000,000 tons in 1903—is three times what it was in 1890. The traffic passing the St. Mary's locks rose from a million and a quarter tons in 1880 to seven and a half millions in 1889, and to forty-one and a quarter million tons in 1906, an increase of 3,200 per cent. This commerce on the Great Lakes has been made possible by total congressional appropriations of less than a hundred million dollars.

The total appropriations made by Congress from the beginning of 1907 for the rivers of the Mississippi Valley amount to $208,484,720. This seems to be a relatively large sum; but it should be remembered first, that over $17,000,000 of this total were expended—and wisely spent—upon the Mississippi River between New Orleans and the Gulf and had reference rather to maritime than to inland commerce; and second, that on some rivers, particularly the Mississippi, appropriations have been largely spent in levee construction and other work which, while indirectly helpful to navigation, was intended primarily to prevent the rviers from destroying the lives and property of those living on or near its banks. With the exception of the Ohio (including the Monongahela and Kanawha) and Mississippi and a few other large rivers, relatively little has been expended since 1890 by the Federal Government in bettering river navigation. When we consider that the United States has spent during the past hundred years in regulating, improving, and extending our system of natural waterways only four and one-half per cent. of the amount private capitalists have invested in the construction of railways, our Congressional appropriations for the betterment of inland navigation seems to have been conservatively small.

In the canalization of rivers the United States is making some headway, portions of twenty-three streams having been canalized to an aggregate length of 1,520 miles in 1906. This, however, was a gain of but 442 miles over the figures of 1889. When only the more important rivers shall have been adequately canalized there will be several times 1,500 miles of slackwater navigation.

The United States operated twelve canals in 1906 with a combined length of 78.19 miles. These, however, were constructed to overcome obstructions to lake and river navigation and were not independent waterways. In 1907 the Hennepin Canal, from the Mississippi River at Rock Island, to the Illinois River at its great bend, was put in operation

by the United States, and this waterway, ninety-six miles long, is the first of its kind to be managed by the Federal Government. Nearly all of the canals in the United States belong to the states or to corporations. The only really important state canal is the Erie, now being modernized by the people of New York.

The highly valuable reports of the United States Commissioner of Navigation contain classified information regarding documented American vessels, the aggregate tonnage of which is about six and a half million tons; but there is an equal tonnage of undocumented craft not included in the tables published by the Bureau of Navigation. Comparatively few people are aware of the fact that American shipping has a total tonnage of over 13,000,000 tons gross register.

The Bureau of the Census has about completed a report on "Transportation by Water" in the United States in 1906. This, like the preceding report of that bureau, which was made in 1889, seventeen years ago, is a valuable document exceptionally complete as regards American shipping, but necessarily less satisfactory regarding passenger and freight traffic, for the simple reason that full and accurate information regarding traffic cannot be obtained until machinery shall have been provided for the systematic and daily recording of freight and passenger movements.

In calling attention to the relatively small amount of information concerning transportation by water obtainable from the regularly published official reports of the Federal Government, there is no thought of criticizing the bureaus by which those reports are compiled and issued. The powers those bureaus possess and the scope of their activities are fixed by law. Congress decides what data the public shall have regarding our navigation resources, and the use made of those resources. As the Inland Waterways Commission states in its preliminary report, this "information is essential to an intelligent treatment of the inland waterways, and it is desirable that means be employed to obtain it;" and the Commission wisely includes in its recommendations "the adoption of means for ascertaining regularly all facts relating to traffic on the inland waterways, and for publishing the same in a form suitable for general use."

According to the report on "Transportation by Water" recently made by the Bureau of the Census, American craft of all classes, exclusive of those in the fishing fleet and those owned by the Federal Government, numbered 39,083, and had a combined tonnage of 13,072,755 in 1906. Of this total there were 1,441 registered vessels—those employed in foreign commerce—and their tonnage amounted to less than a million (939,486) tons gross. Thus the craft constructed for domestic trade included 37,642 vessels, with a tonnage of 12,133,269. In addition to this there was a fleet of 6,910 vessels with a total tonnage of 196,132, employed in catching and transporting fish, and a great host—82,443—of small boats and launches used in the fishing industry.

The census taken in 1906 shows that there were 37,321 vessels actively employed in domestic and foreign commerce of the United States, of which total 20,032 were operated from the Atlantic and Gulf coast, 2,537 on the Pacific coast (including Alaska), 2,990 on the Great Lakes and St. Lawrence, 9,622 on the Mississippi River and its tributaries, and 2,140 on our other inland waters. The gross tonnage of the Great Lakes' fleet was 2,392,863, 18.4 per cent. of the total for all American merchant craft in 1906; the tonnage of boats and barges—mainly coal barges—on the Mississippi and its tributaries was 4,411,967, 34.2 per cent. of the total; and the tonnage of the craft on other inland waters was 259,491, or 2.01 per cent. of all American shipping. The tonnage of the river and canal craft thus amounted to 4,671,458, or 36 per cent. of the total of all active American shipping.

The freight shipped on the Great Lakes in 1907 amounted to 83,498,171 tons; the total for the previous year—the one covered by the census report—was 75,610,690 tons, which was 42.6 per cent. of the total freight, exclusive of harbor traffic, handled upon American waterways coastwise and inland. The traffic of the Mississippi River and its tributaries in 1906 was 19,531,093 tons, or eleven per cent. of the total. On the other inland waterways the freight aggregated 3,716,765 tons, or 2.1 per cent. of the total. The combined traffic on the Great Lakes and our other inland waterways in 1906 was 98,858,548 tons, 55.7 per cent. of the total water-borne domestic commerce of the United States.

Such was the traffic in 1906. Comparisons with the previous census of 1889 will show where progress has taken place and what waterways have gained and what have lost in tonnage. The most rapid growth has been in the commerce of the Great Lakes, which rose from 25,266,978 tons of shipments in 1889 to 75,610,690 tons in 1906. The port-to-port traffic of the Mississippi River and its tributaries in 1906 amounted to 19,531,093 tons of freight. There was also handled locally in and about the harbors 8,325,548 tons, making a total of 27,856,641 tons for the rivers of the Mississippi Valley. In 1899 the figures were 29,401,403, there having been a decrease of 1,544,768 tons in the seventeen years. The freight handled on the other inland waterways of the United States experienced a very large decline during this period, the total tonnage of freight carried having fallen from 11,221,224 tons in 1889 to 3,944,655 tons in 1906.

In order to make the statement of traffic complete the passenger business must be included. The highly efficient steamers of the

lake lines carried 14,080,146 passengers in 1906; the figures for 1889 were 2,235,993, the increase during the seventeen years being 529.7 per cent. There was also an increase of thirty per cent. in the passenger traffic handled on the Mississippi River and its tributaries, the figures for 1889—10,858,894—having risen by 1906 to 14,122,241. It should be noted, however, that this increase was due more largely to the growth in short-distance travel and in ferry traffic than to an increased patronage of the river steamboats operated over the longer routes. The passenger traffic on the other inland waterways of the United States in 1889 is not known, but it amounted to something less than two millions (1,877,889) in 1906.

A comparison of the United States with some of the leading countries of Europe as to the extent to which the navigation resources of each country have been developed, and as to the traffic uses made of inland waterways will contribute to a clearer appreciation of the facts concerning the United States.

Great Britain.—Although Great Britain is of small territorial area and has not followed the policy adhered to by the continental countries of retaining the inland waterways as public highways to be developed by the government, the mileage and traffic of her streams and canals are by no means insignificant. The total coast line of Great Britain, 3,900 miles in length, is supplemented by about 4,000 miles of canals and improved rivers. The traffic on these inland waterways, exclusive of the coastwise maritime commerce, amounted to 37,426,886 tons in 1898, the latest year for which official Board of Trade statistics are obtainable.

The five principal estuaries of England—the Mersey, Humber, Wash, Thames, and Severn—are connected by nineteen through canal routes. Nine of these through routes reach Severn ports, nine have London termini, ten reach Liverpool, and five terminate at Hull. The traffic is most active on the canals in central and northern England. The 642 miles of waterways in this highly developed industrial district moved 23,500,000 tons of freight in 1898. The canals reaching Birmingham had 7,750,000 tons of traffic.

The water resources of Great Britain have come to be such a valuable asset to the country that the supply and the uses of water must be carefully guarded. If the streams are to be maintained as navigable waterways, if the municipalities are to have an abundant supply of pure water, the mining companies must not be permitted to continue their reckless waste of water; the disposal of sewage must be carefully planned so as to prevent the pollution of the streams; and if the valuable fisheries in the tidal and fresh-water portions of the rivers are to be preserved, careful regulation will be necessary. In a word, the necessity for a permanent waterways commission is becoming apparent.

France.—France has developed her inland waterways more systematically and completely than has any other of the larger European countries. Three thousand sixty-two miles of canals are now in operation, and 4,500 miles of her rivers—largely as the result of canalization—are used for navigation. Prior to 1880, the greater portion of the English freight business of the country was handled on the waterways. Since then the development of the railroads has naturally enabled them to exceed the waterways in tonnage; but the waterways have, none the less, transported a steadily increasing tonnage. During the twenty years from 1885 to 1905 the freight tonnage rose from 19,573,000 to 34,030,000 metric tons. The ton mileage of the water-borne traffic amounted to 3,178,000,000 in 1905, and was more than double the total for 1885. All the waterways of the country, with the exception of 160 miles (seventy-five of which are owned by the city of Paris) are public ways improved and maintained by the state. Their use is free, tolls having been abolished in 1880.

Germany.—The policy of Germany in the development of her inland waterways is peculiarly instructive. The canals and navigable rivers of that empire, not including the tidal portions of the rivers navigated by sea-going vessels, have a total length of about 7,600 miles, of which about 6,250 miles may be considered to be commercially important. Three-tenths of the 6,250 miles consist of canals and slack-water river navigation, and seven-tenths of river courses improved without the construction of dams and locks. The railway mileage of the country is 34,000, somewhat over six times the length of the waterways actively used for commerce.

The tonnage of the shipments and receipts of freight transported on the German waterways in 1875 was 20,800,000 metric tons. The figures for 1905 were 103,400,000 metric tons, there having been an increase of nearly 400 per cent. The ton mileage of this water-borne commerce in 1875 was 1,812,500,000, and in 1905, 9,375,000,000—a gain of over 400 per cent. The ton mileage of the railroad freight traffic in 1875 was 6,812,500,000, and in 1905 the total was 27,875,000,000. The gain in the railroad traffic was far greater absolutely; but the percentage of increase in water traffic was larger, although the length of the waterways in 1905 was not much greater than in 1875, whereas the railway mileage had more than doubled during that period.

The density of traffic on the German waterways much exceeds that on the railroads. The number of tons carried one mile per mile of waterway rose from 290,000 in 1875 to 1,500,000 in 1905; the corre-

sponding figures for the railways were 410,000 tons carried one mile per mile of line in 1875, and 800,000 in 1905. The relative importance of the traffic of the railways and waterways in Germany is shown by the fact that twenty-five per cent. of the total ton mileage of rail and water traffic in 1905 was water borne, and seventy-five per cent. moved upon rails. Thirty years earlier the waterways had twenty-one per cent. and the railroads had seventy-nine per cent. of the combined ton mileage.

These brief references to England, France, and Germany suffice to show that the United States has as yet done less than has been done by her leading industrial and commercial rivals in the development and use of inland waterways, if we except—as of course we ought—the chain of Great Lakes which have no counterpart in any other country. Whether it is desirable that the United States should follow the example of France and Germany as regards inland water transportation is a question to which the American people are now giving serious thought. There can be no uncertainty as to the importance of the transportation services performed by our coastwise shipping, and by the fleet operated on the Great Lakes. The coastwise and Great Lakes traffic is rapidly growing; but upon our canals and many of our rivers, traffic languishes or declines.

Is it wise, it may be asked, for the United States to spend money in constructing canals and improving our rivers, and if so, under what conditions and to what extent? This is too large a question for one to attempt to answer fully in a short paper, the primary purpose of which is to present data rather than to draw conclusions; but some indication as to what policy may best be adopted may be given by calling attention briefly to the causes that account for the decline in canal and river traffic and by stating certain facts which seem to indicate that well-developed inland waterways may assist largely in the future economic progress of our country.

The causes accounting for the decline in the traffic upon our canals and rivers have been so clearly stated by the President in his address and in his special message of February 26, 1908, transmitting to Congress the preliminary report of the Inland Waterways Commission, and the same subject has been so fully presented in that report that a detailed discussion of those causes seems unnecessary.

The primary reason for the decline in the use of canals of such small dimensions and river channels so shallow as to permit the use only of craft capable of transporting 100 to 200 tons of cargo, is to be found in the very success which the railways of the United States have had in providing cheap transportation for heavy and bulky commodities. In no other country of the world have rail transportation costs been reduced to such a low figure. The ability of our railroads to handle this class of traffic so economically has resulted not only from the genius of the Americal people in the use of machinery to do man's heavy work, but also, and more largely, from the fact that by far the greater share of the tonnage of American railroads consists of such bulky commodities as coal, iron, ore, lumber, and grain, which can be handled not only in carload lots, but in train-loads, and which, from the very size of our country, must be moved long distances in order to reach the manufacturing centers of the United States and the primary markets within and without our borders.

In many other countries it has been found more economical to do the heavier transportation work by making large use of waterways, and to develop the railway traffic more particularly with reference—and this is especially the case with England, France, and Germany—to the speedy movement and schedule delivery of parcels, packages, and general commodity freight. This organization of the transportation service by rail is possible where there is a division of the transportation work between the railroads and waterways, and it results in the close co-ordination of railroad freight traffic with the wholesale and retail trade. It enables merchants and manufacturers to reduce capital costs and warehousing expenses to a minimum. It meets the needs of densely populated and highly developed industrial countries such as France and Germany, and especially of such a country as Great Britain, for, although the inland waterways of Great Britain are, as a whole, less carefully developed than are those of France and Germany, a large share of the domestic commerce of the United Kingdom is carried by water. The navigation services which most countries can secure only by means of inland waterways, the island of Great Britain, with its 3,900 miles of tidal coast, obtains from the surrounding ocean—the best of all highways.

Such an organization of the business of transportation as has been worked out in the three European countries just mentioned, does not result in as low average freight rates by rail as prevail in the United States; but the cost of wholesale and retail distribution and of many manufacturing activities are undoubtedly less than they would be were the people of Europe served almost entirely by railroads and not by railroads and waterways. Our dependence upon railroads, almost exclusively, for the movement of bulky commodities long distances even at low average rates, while we at the same time neglect the development and use of our inland waterways, does not necessarily mean that we have organized our work of production and distribution in the most economical manner. Indeed, there can be little doubt that as social and indus-

trial conditions in the United States approach more closely those prevailing in Europe, we shall find it increasingly desirable to provide ourselves both with well-developed waterways for handling much of our bulky traffic and with railroads more efficient than present conditions permit them to be in the handling of package freight. We, as well as Europe, will find it profitable to minimize capital and warehousing costs.

The construction of canals and the improvement of rivers in the United States have progressed slowly, in part at least, because the Federal Government has in the past left to the states the work of canal building, and, to some extent, the canalization of rivers. Several of the states, after having made costly mistakes in the execution of their earlier works of internal improvement, have been disposed to leave to private capital the creation of such waterways as special business interests might find it profitable to establish. In many instances the states have thought best to dispose of their waterways to the railroad companies, which have generally found it unprofitable to maintain both rail and water routes. The policy of leaving the development of water transportation to any considerable extent, either to the states or to private corporations, is now realized to be wrong in theory and unsatisfactory in practice.

The states are manifestly incompetent to carry out the improvement of our national waterways, such as the Mississippi, Ohio, Missouri, and Columbia rivers. Their development has always been a national concern. The construction of such waterways as the Erie and Panama canals are clearly works that private capital is neither able nor disposed to execute. The great State of New York has the financial ability and economic incentive to reconstruct the Erie Canal; but its route is so clearly national that the waterway should have long since been taken over and enlarged by the Federal Government.

The experience of our own country and of other nations shows conclusively that waterways should be public ways—that their execution and maintenance should be by the Government. The entire network of American waterways should be improved and extended systematically by one authority, and with reference to the economic and social needs of the entire nation. There is only one power whose authority is as wide as our country, and that is the Federal Government. In the future but small place in the development and control of waterways will be given either to the states or to private corporations.

There can be no doubt that the inland waterways of the United States will be more extensively used in the future than they have been in the past. The reasons for this are numerous and conclusive:

1. The internal commerce of the United States is growing rapidly and is certain to increase with accelerating speed. The demands for transportation facilities are expanding so swiftly as to make it apparent that the products of our farms, mines, forests, and factories cannot secure ready and economical transportation unless at least the larger water routes of the country are adapted to the needs of commerce.

2. The necessity for the development of our waterways is emphasized by the fact that any considerable future reductions in the costs of rail transportation are improbable. Indeed, for reasons that have already been stated in this paper, the service of American railroads may be expected to be developed in the future more and more with reference to handling commodities expeditiously and in small units. That is what is taking place in other countries; there is no reason to suppose that our experience will differ greatly from theirs. The economy of employing both railroads and waterways for the performance of the transportation services becomes greater in every country with the increase in population and the development and specialization of industry.

3. American waterways will, in the years to come, be utilized more for navigation, because we are certain, sooner or later, to conserve and use the entire water resources of the country simultaneously not only for navigation, but also for irrigation, for water-power, and for supplying our urban populations with pure water. Moreover, the growing necessity for controlling our streams so as to make possible the reclamation of our vast areas of reclaimable lands will tend to hasten the time when our principal waterways will be so regulated as to be serviceable for navigation.

It the past we have permitted the reckless destruction of our forests, and it has been our practice to let the streams spread their floods destructively over their valleys and hurry their surplus water to the sea. We cannot long afford to be so wasteful of one of our greatest natural resources. We ought to, and we shall, reforest our wild mountain areas, we shall hold back the flood waters to irrigate our arid lands, to turn the wheels of industry, to maintain the channels of navigation, to give the towns and cities their water-supply, and to equalize the seasonal flow of our rivers so that neither flood nor low water shall be a recurring menace to life and property.